



1

# SEQUENCE LISTING

<110> RIKIHISA, YASUKO  
OHASHI, NORIO

<120> OUTER MEMBRANE PROTEIN OF EHRLICHIA CANIS AND EHRLICHIA  
CHAFTEENSIS

<130> 22727-04109

<140> 10/059,964

<141> 2002-01-28

<150> 09/314,701

<151> 1999-05-19

<150> 60/100,843

<151> 1998-09-18

<160> 69

<170> PatentIn Ver. 3.2

<210> 1

<211> 846

<212> DNA

<213> Ehrlichia chaffeensis

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ccaaacgatg tattcactgt ctcaaattat tcattttaa atgaaaacaa cccgttttta 300
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<213> Ehrlichia chaffeensis

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Pro Asn Asp Val Phe Thr Val Ser Asn Tyr Ser Phe Lys Tyr Glu Asn  
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His Asn Ser Ala Ala Asp Met Ser Ser Ala Ser Asn Asn Phe Val Phe  
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Leu Lys Asn Glu Gly Leu Leu Asp Ile Ser Phe Met Leu Asn Ala Cys  
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Tyr Asp Val Val Gly Glu Gly Ile Pro Phe Ser Pro Tyr Ile Cys Ala  
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Gly Ile Gly Thr Asp Leu Val Ser Met Phe Glu Ala Thr Asn Pro Lys  
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Ile Ser Tyr Gln Gly Lys Leu Gly Leu Ser Tyr Ser Ile Ser Pro Glu  
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Ala Ser Val Phe Ile Gly Gly His Phe His Lys Val Leu Gly Asn Glu  
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Phe Arg Asp Ile Pro Thr Ile Ile Pro Thr Gly Ser Thr Leu Ala Gly  
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Lys Gly Asn Tyr Pro Ala Ile Val Ile Leu Asp Val Cys His Phe Gly  
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                     50                    55                    60  
 Ile Asn Gly Asn Thr Ser Ile Thr Lys Lys Val Phe Gly Leu Lys Lys  
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                     85                    90                    95  
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 Tyr Ala Met Asp Gly Pro Arg Ile Glu Leu Glu Ala Ala Tyr Gln Lys  
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 Tyr Lys Tyr Phe Gly Leu Ser Arg Glu Asp Ala Ile Ala Asp Lys Lys  
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 Tyr Val Val Leu Lys Asn Glu Gly Ile Thr Phe Met Ser Leu Met Val  
 165 170 175  
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 180 185 190  
 Ala Cys Ala Gly Val Gly Ala Asp Leu Ile Asn Val Phe Lys Asp Phe  
 195 200 205  
 Asn Leu Lys Phe Ser Tyr Gln Gly Lys Ile Gly Ile Ser Tyr Pro Ile  
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 Thr Pro Glu Val Ser Ala Phe Ile Gly Gly Tyr Tyr His Gly Val Ile  
 225 230 235 240  
 Gly Asn Asn Phe Asn Lys Ile Pro Val Ile Thr Pro Val Val Leu Glu  
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 cctactgtcg cgttgtatgg tttgaaacaa gattggaacg gtgttagtgc ttcaagtcac 240  
 gctgatgcgg actttaataa caaaggttat tcttttaaat acgaaaacaa tccattttcta 300  
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 aaccagaag cttctgtctt tgttggtgga cattttcata aagttgcagg taatgaattc 720  
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His Phe Gly Val Phe Ser Ala Lys Glu Glu Lys Asn Pro Thr Val Ala  
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Leu Tyr Gly Leu Lys Gln Asp Trp Asn Gly Val Ser Ala Ser Ser His  
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Ala Asp Ala Asp Phe Asn Asn Lys Gly Tyr Ser Phe Lys Tyr Glu Asn  
85 90 95

Asn Pro Phe Leu Gly Phe Ala Gly Ala Ile Gly Tyr Ser Met Gly Gly  
100 105 110

Pro Arg Ile Glu Phe Glu Val Ser Tyr Glu Thr Phe Asp Val Lys Asn  
115 120 125

Gln Gly Gly Asn Tyr Lys Asn Asp Ala His Arg Tyr Cys Ala Leu Asp  
130 135 140

Arg Lys Ala Ser Ser Thr Asn Ala Thr Ala Ser His Tyr Val Leu Leu  
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Lys Asn Glu Gly Leu Leu Asp Ile Ser Leu Met Leu Asn Ala Cys Tyr  
165 170 175

Asp Val Val Ser Glu Gly Ile Pro Phe Ser Pro Tyr Ile Cys Ala Gly  
180 185 190

Val Gly Thr Asp Leu Ile Ser Met Phe Glu Ala Ile Asn Pro Lys Ile  
195 200 205

Ser Tyr Gln Gly Lys Leu Gly Leu Ser Tyr Ser Ile Asn Pro Glu Ala  
210 215 220

Ser Val Phe Val Gly Gly His Phe His Lys Val Ala Gly Asn Glu Phe  
225 230 235 240

Arg Asp Ile Ser Thr Leu Lys Ala Phe Ala Thr Pro Ser Ser Ala Ala  
245 250 255

Thr Pro Asp Leu Ala Thr Val Thr Leu Ser Val Cys His Phe Gly Val  
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ggaaagtata tgccaagcgc ttcgcatttt ggagtttttt ctgccaagga agaaagaaat 180
acaacagttg gagtattttg aatagagcaa gattgggata gatgtgtaat atctagaacc 240
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<213> *Ehrlichia chaffeensis*

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Ile Ser Gly Asn Phe Tyr Ile Ser Gly Lys Tyr Met Pro Ser Ala Ser
      35              40              45

His Phe Gly Val Phe Ser Ala Lys Glu Glu Arg Asn Thr Thr Val Gly
      50              55              60

Val Phe Gly Ile Glu Gln Asp Trp Asp Arg Cys Val Ile Ser Arg Thr
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Thr Leu Ser Asp Ile Phe Thr Val Pro Asn Tyr Ser Phe Lys Tyr Glu
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 Ser His Leu Leu Gly Thr Glu Thr Gln Ile Asp Gly Ala Gly Ser Ala  
 145 150 155 160  
 Ser Val Phe Leu Ile Asn Glu Gly Leu Leu Asp Lys Ser Phe Met Leu  
 165 170 175  
 Asn Ala Cys Tyr Asp Val Ile Ser Glu Gly Ile Pro Phe Ser Pro Tyr  
 180 185 190  
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 195 200 205  
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 210 215 220  
 Ser Pro Glu Ala Ser Val Phe Ile Gly Gly His Phe His Lys Val Ile  
 225 230 235 240  
 Gly Asn Glu Phe Arg Asp Ile Pro Thr Met Ile Pro Ser Glu Ser Ala  
 245 250 255  
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 cctactgttg cattgtatgg cttaaaacaa gattgggaag ggattagctc atcaagtcac 240  
 aatgataatc atttcaataa caagggttat tcattttaa atgaaaataa cccattttta 300  
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Ile	Ser	Gly	Asn	Phe	Tyr	Val	Ser	Gly	Lys	Tyr	Met	Pro	Ser	Ala	Ser
		35					40					45			
His	Phe	Gly	Met	Phe	Ser	Ala	Lys	Glu	Glu	Lys	Asn	Pro	Thr	Val	Ala
	50					55					60				
Leu	Tyr	Gly	Leu	Lys	Gln	Asp	Trp	Glu	Gly	Ile	Ser	Ser	Ser	Ser	His
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				165					170					175	
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			180					185					190		
Val	Gly	Thr	Asp	Leu	Ile	Ser	Met	Phe	Glu	Ala	Thr	Asn	Pro	Lys	Ile
		195					200					205			
Ser	Tyr	Gln	Gly	Lys	Leu	Gly	Leu	Ser	Tyr	Ser	Ile	Asn	Pro	Glu	Ala
	210					215					220				



Ser Val Phe Ile Gly Gly His Phe His Lys Val Ile Gly Asn Glu Phe  
 225 230 235 240

Arg Asp Ile Pro Thr Leu Lys Ala Phe Val Thr Ser Ser Ala Thr Pro  
 245 250 255

Asp Leu Ala Ile Val Thr Leu Ser Val Cys His Phe Gly Ile Glu Leu  
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 35 40 45  
 His Phe Gly Val Phe Ser Ala Lys Gln Glu Arg Asn Thr Thr Thr Gly  
 50 55 60

Val	Phe	Gly	Leu	Lys	Gln	Asp	Trp	Asp	Gly	Ser	Thr	Ile	Ser	Lys	Asn	65	70	75	80
Ser	Pro	Glu	Asn	Thr	Phe	Asn	Val	Pro	Asn	Tyr	Ser	Phe	Lys	Tyr	Glu	85	90	95	
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Gly	Pro	Arg	Ile	Glu	Leu	Glu	Met	Ser	Tyr	Glu	Thr	Phe	Asp	Val	Lys	115	120	125	
Asn	Gln	Gly	Asn	Asn	Tyr	Lys	Asn	Asp	Ala	His	Lys	Tyr	Tyr	Ala	Leu	130	135	140	
Thr	His	Asn	Ser	Gly	Gly	Lys	Leu	Ser	Asn	Ala	Gly	Asp	Lys	Phe	Val	145	150	155	160
Phe	Leu	Lys	Asn	Glu	Gly	Leu	Leu	Asp	Ile	Ser	Leu	Met	Leu	Asn	Ala	165	170	175	
Cys	Tyr	Asp	Val	Ile	Ser	Glu	Gly	Ile	Pro	Phe	Ser	Pro	Tyr	Ile	Cys	180	185	190	
Ala	Gly	Val	Gly	Thr	Asp	Leu	Ile	Ser	Met	Phe	Glu	Ala	Ile	Asn	Pro	195	200	205	
Lys	Ile	Ser	Tyr	Gln	Gly	Lys	Leu	Gly	Leu	Ser	Tyr	Ser	Ile	Ser	Pro	210	215	220	
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Gly	Asn	His	Phe	Thr	Ile	Val	Thr	Leu	Ser	Val	Cys	His	Phe	Gly	Val	260	265	270	
Glu	Leu	Gly	Gly	Arg	Phe	Asn	Phe									275	280		

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&lt;211&gt; 894

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&lt;400&gt; 13

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gctttacatg taaaatttgc ttaccaaggc aaactaggta ttagctatca actattttact 720
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ttaaacgtaa accatgttta cacacttaaa gaatctccta aagtcacatc tgcagtagct 840
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<400> 14

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Met Glu Asn Leu Met Asn Lys Lys Asn Lys Phe Phe Thr Ile Ser Thr
  1              5              10              15

Ala Met Val Cys Leu Leu Leu Leu Pro Gly Ile Ser Phe Ser Glu Thr
          20              25              30

Ile Asn Asn Ser Ala Lys Lys Gln Pro Gly Leu Tyr Ile Ser Gly Gln
          35              40              45

Tyr Lys Pro Ser Val Ser Val Phe Ser Asn Phe Ser Val Lys Glu Thr
          50              55              60

Asn Val Pro Thr Lys Gln Leu Ile Ala Leu Lys Lys Asp Ile Asn Ser
          65              70              75              80

Val Ala Val Gly Ser Asn Ala Thr Thr Gly Ile Ser Asn Pro Gly Asn
          85              90              95

Phe Thr Ile Pro Tyr Thr Ala Glu Phe Gln Asp Asn Val Ala Asn Phe
          100             105             110

Asn Gly Ala Val Gly Tyr Ser Phe Pro Asp Ser Leu Arg Ile Glu Ile
          115             120             125

Glu Gly Phe His Glu Lys Phe Asp Val Lys Asn Pro Gly Gly Tyr Thr
          130             135             140

Gln Val Lys Asp Ala Tyr Arg Tyr Phe Ala Leu Ala Arg Asp Leu Lys
          145             150             155             160

Asp Gly Phe Phe Glu Pro Lys Ala Glu Asp Thr Gly Val Tyr His Thr
          165             170             175

Val Met Lys Asn Asp Gly Leu Ser Ile Leu Ser Thr Met Val Asn Val
          180             185             190

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Cys Tyr Asp Phe Ser Val Asp Glu Leu Pro Val Leu Pro Tyr Ile Cys  
 195 200 205

Ala Gly Met Gly Ile Asn Ala Ile Glu Phe Phe Asp Ala Leu His Val  
 210 215 220

Lys Phe Ala Tyr Gln Gly Lys Leu Gly Ile Ser Tyr Gln Leu Phe Thr  
 225 230 235 240

Lys Val Asn Leu Phe Leu Asp Gly Tyr Tyr His Gln Val Ile Gly Asn  
 245 250 255

Gln Phe Lys Asn Leu Asn Val Asn His Val Tyr Thr Leu Lys Glu Ser  
 260 265 270

Pro Lys Val Thr Ser Ala Val Ala Thr Leu Asp Ile Ala Tyr Phe Gly  
 275 280 285

Gly Glu Val Gly Ile Arg Phe Thr Phe  
 290 295

<210> 15

<211> 591

<212> DNA

<213> Ehrlichia chaffeensis

<400> 15

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atgatataa aagaaaaact tactagagtg ggagaatata tcttagcata tttatcattt 60
attctttcta cttatatctt tctagtgtg gtaaataatta ttagatataa cagccttgct 120
atatgtgtta tcagtctact aagaactaat atctttaacg ttagcacaaa aaaattaata 180
aaagataaat gtcgtgatac taagttagt aacatgaatt gttatttgta cggtaaaccg 240
ttaaatttac aaatttttta tggaatattt tcctttatta gaaactttca aaataacaca 300
ctaataattc ctaatgatag taaatgcggc ttctatacca cgttatggga taatccagca 360
ctacattata catatacact tactggcagt gaggaccgta atttttttga cattctatat 420
gaaaacatta tctgtcaatg taaattactt attaactata accgttctgt attaaaccaa 480
cataataaaa atactctcgt aataatacca atacctaatg ctagagagtt cagtaatgaa 540
attcgagtaa ggaatatatc aataaataag gaaagttctt atgagtgcta a 591
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<210> 16

<211> 196

<212> PRT

<213> Ehrlichia chaffeensis

<400> 16

Met Ile Tyr Lys Glu Lys Leu Thr Arg Val Gly Glu Tyr Ile Leu Ala  
 1 5 10 15

Tyr Leu Ser Phe Ile Leu Ser Thr Tyr Ile Phe Leu Val Leu Val Asn  
 20 25 30

Ile Ile Arg Tyr Asn Ser Leu Ala Ile Cys Val Ile Ser Leu Leu Arg  
 35 40 45

Thr Asn Ile Phe Asn Val Ser Thr Lys Lys Leu Ile Lys Asp Lys Cys  
 50 55 60  
 Arg Asp Thr Lys Phe Ser Asn Met Asn Cys Tyr Leu Tyr Gly Lys Pro  
 65 70 75 80  
 Leu Asn Leu Gln Ile Phe Tyr Gly Ile Phe Ser Phe Ile Arg Asn Phe  
 85 90 95  
 Gln Asn Asn Thr Leu Ile Ile Pro Asn Asp Ser Lys Cys Gly Phe Tyr  
 100 105 110  
 Thr Thr Leu Trp Asp Asn Pro Ala Leu His Tyr Thr Tyr Thr Leu Thr  
 115 120 125  
 Gly Ser Glu Tyr Arg Asn Phe Phe Asp Ile Leu Tyr Glu Asn Ile Ile  
 130 135 140  
 Cys Gln Cys Lys Leu Leu Ile Asn Tyr Asn Arg Ser Val Leu Asn Gln  
 145 150 155 160  
 His Asn Lys Asn Thr Leu Val Ile Ile Pro Ile Pro Asn Ala Arg Glu  
 165 170 175  
 Phe Ser Asn Glu Ile Arg Val Arg Asn Ile Ser Ile Asn Lys Glu Ser  
 180 185 190  
 Ser Tyr Glu Cys  
 195

<210> 17  
 <211> 876  
 <212> DNA  
 <213> *Ehrlichia chaffeensis*

<400> 17  
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 agtgtatcgt ttccagaggt tacaacagc agtattaaaa aacactctgg gttatatatt 120  
 agtggacaat acaaaccaag tgtttctggt ttttagtagtt tctcaattaa agaaactaac 180  
 actatcacaa aaaatccttat agcggttaaaa aaagatatta actctcttga agttaacgcc 240  
 gatgctagtc aagggtattag tcatccagga aattttacta taccttatat agcagcattt 300  
 gaagataatg cttttaattt caacgggtgct attgggttaca ttactgaagg tctaaggatt 360  
 gaaatagaag gttcctatga agaatttgat gctaaaaacc ctggagggtta tgggtctaaat 420  
 gatgcctttc ggtactttgc tttagcacgt gatatggaaa gcaacaagtt ccaacaaaaa 480  
 gcacaaagct cacaaaaagt atttcacact gtaatgaaga gtgatgggtt atctataata 540  
 tctatcatgg ttaacggctg ttatgatatt tcttcggata atttattagt atcaccttat 600  
 atatgtggag gtatagggtg ggatgcaata gaattttttg acgcattaca cattaaactt 660  
 gcgtgccaaa gcaaatttag catcaccttat caattatctt ataatatcag cttatttgct 720  
 gatggatatt atcatcaagt aataggtaac caattcagaa atttaaactg tcaacatgta 780  
 gctgaactta atgatgcacc taaagttaca tctgcagttg ccacacttaa tgttggatat 840  
 ttcggcgctg aagttggagt aagatttata ttttaa 876

<210> 18  
 <211> 291  
 <212> PRT  
 <213> Ehrlichia chaffeensis

<400> 18  
 Met Asn Lys Lys Asn Lys Phe Ile Ile Ala Thr Ala Leu Val Tyr Leu  
   1                  5                  10                  15  
 Leu Ser Leu Pro Ser Val Ser Phe Ser Glu Val Thr Asn Ser Ser Ile  
           20                  25                  30  
 Lys Lys His Ser Gly Leu Tyr Ile Ser Gly Gln Tyr Lys Pro Ser Val  
           35                  40                  45  
 Ser Val Phe Ser Ser Phe Ser Ile Lys Glu Thr Asn Thr Ile Thr Lys  
       50                  55                  60  
 Asn Leu Ile Ala Leu Lys Lys Asp Ile Asn Ser Leu Glu Val Asn Ala  
   65                  70                  75                  80  
 Asp Ala Ser Gln Gly Ile Ser His Pro Gly Asn Phe Thr Ile Pro Tyr  
           85                  90                  95  
 Ile Ala Ala Phe Glu Asp Asn Ala Phe Asn Phe Asn Gly Ala Ile Gly  
           100                  105                  110  
 Tyr Ile Thr Glu Gly Leu Arg Ile Glu Ile Glu Gly Ser Tyr Glu Glu  
       115                  120                  125  
 Phe Asp Ala Lys Asn Pro Gly Gly Tyr Gly Leu Asn Asp Ala Phe Arg  
       130                  135                  140  
 Tyr Phe Ala Leu Ala Arg Asp Met Glu Ser Asn Lys Phe Gln Pro Lys  
       145                  150                  155                  160  
 Ala Gln Ser Ser Gln Lys Val Phe His Thr Val Met Lys Ser Asp Gly  
           165                  170                  175  
 Leu Ser Ile Ile Ser Ile Met Val Asn Gly Cys Tyr Asp Phe Ser Ser  
       180                  185                  190  
 Asp Asn Leu Leu Val Ser Pro Tyr Ile Cys Gly Gly Ile Gly Val Asp  
       195                  200                  205  
 Ala Ile Glu Phe Phe Asp Ala Leu His Ile Lys Leu Ala Cys Gln Ser  
       210                  215                  220  
 Lys Leu Gly Ile Thr Tyr Gln Leu Ser Tyr Asn Ile Ser Leu Phe Ala  
       225                  230                  235                  240  
 Asp Gly Tyr Tyr His Gln Val Ile Gly Asn Gln Phe Arg Asn Leu Asn  
           245                  250                  255

Val Gln His Val Ala Glu Leu Asn Asp Ala Pro Lys Val Thr Ser Ala  
 260 265 270

Val Ala Thr Leu Asn Val Gly Tyr Phe Gly Ala Glu Val Gly Val Arg  
 275 280 285

Phe Ile Phe  
 290

<210> 19  
 <211> 396  
 <212> DNA  
 <213> Ehrlichia chaffeensis

<400> 19  
 tctagaatac atgatgaaaa ttatgctatt acaacaaata ataaattatc catcgcatct 60  
 attatgggta acacctgcta tgatatttca attaataata catcaatagt accgtattta 120  
 tgcacaggca ttgggtgaaga tcttgtaggg ctttttaata caatacattt taaacttgca 180  
 tatcaaggga aagttggaat gagttatttg ataaataaca atatcctatt attttctgac 240  
 atatattatc ataaagtcac gggtaacaga tttaaaaatt tgtacatgca atatgtagct 300  
 gatcctaata tttctgaaga aactatacct atattagcaa aacttgatat tggttatttt 360  
 ggaagtgaag ttggaataag gtttatgttt aactaa 396

<210> 20  
 <211> 131  
 <212> PRT  
 <213> Ehrlichia chaffeensis

<400> 20  
 Ser Arg Ile His Asp Glu Asn Tyr Ala Ile Thr Thr Asn Asn Lys Leu  
 1 5 10 15  
 Ser Ile Ala Ser Ile Met Val Asn Thr Cys Tyr Asp Ile Ser Ile Asn  
 20 25 30  
 Asn Thr Ser Ile Val Pro Tyr Leu Cys Thr Gly Ile Gly Glu Asp Leu  
 35 40 45  
 Val Gly Leu Phe Asn Thr Ile His Phe Lys Leu Ala Tyr Gln Gly Lys  
 50 55 60  
 Val Gly Met Ser Tyr Leu Ile Asn Asn Asn Ile Leu Leu Phe Ser Asp  
 65 70 75 80  
 Ile Tyr Tyr His Lys Val Met Gly Asn Arg Phe Lys Asn Leu Tyr Met  
 85 90 95  
 Gln Tyr Val Ala Asp Pro Asn Ile Ser Glu Glu Thr Ile Pro Ile Leu  
 100 105 110

Ala Lys Leu Asp Ile Gly Tyr Phe Gly Ser Glu Ile Gly Ile Arg Phe  
 115 120 125

Met Phe Asn  
 130

<210> 21  
 <211> 888  
 <212> DNA  
 <213> *Ehrlichia chaffeensis*

<400> 21  
 atgacaaaga aattttaattt tgtaaattgtt atattaacat ttttggttatt tctttttccca 60  
 cttaagtcac ttacaacata tgcaaataat aacacaatca ctcaaaaagt tggattgtac 120  
 ataagtggtc aatataagcc aagtattcct catttcaaga attttttcagt agaagaaaat 180  
 gacaaagtag tagattttgat aggtccttaca actgatgtta catatatcac agaacatata 240  
 ttacgagata atacaaaatt caacactcat tatattgcaa agttcaagaa caattttata 300  
 aatttcagca gtgcaattgg ttattattct gggcaaggac caagggttaga aatagaaagc 360  
 tcttatgggg attttgatgt tgtaaattat aaaaattatg cagtacaaga tgtaataaga 420  
 tattttgctt tagtacgtga aaaaaatggt tcaaatttct ctccaaaacc acatgaaact 480  
 agtcaaccct ctgacagtaa tcctaaaaag tctttttata ctttaatgaa gaataatggg 540  
 gtatttggtg catcagtaat aatcaacggt tgttatgatt tttcttttaa taacacaaca 600  
 atatcacctt acgtatgtat aggagttgga ggagatttta tagagttttt tgaagtaatg 660  
 catatcaagt ttgcttgcca aagtaagggt ggtattagct atccaatatc tccctctatt 720  
 actatTTTTTg ctgatgcaca ttatcacaag gtcataaata ataaatttaa caacctacat 780  
 gttaagtatt catatgaact taaaaactca cctaccatta cctctgcaac agccaaacta 840  
 aacattgaat attttggtgg tgaagttggg atgagattta tatttttaa 888

<210> 22  
 <211> 295  
 <212> PRT  
 <213> *Ehrlichia chaffeensis*

<400> 22  
 Met Thr Lys Lys Phe Asn Phe Val Asn Val Ile Leu Thr Phe Leu Leu  
 1 5 10 15  
 Phe Leu Phe Pro Leu Lys Ser Phe Thr Thr Tyr Ala Asn Asn Asn Thr  
 20 25 30  
 Ile Thr Gln Lys Val Gly Leu Tyr Ile Ser Gly Gln Tyr Lys Pro Ser  
 35 40 45  
 Ile Pro His Phe Lys Asn Phe Ser Val Glu Glu Asn Asp Lys Val Val  
 50 55 60  
 Asp Leu Ile Gly Leu Thr Thr Asp Val Thr Tyr Ile Thr Glu His Ile  
 65 70 75 80  
 Leu Arg Asp Asn Thr Lys Phe Asn Thr His Tyr Ile Ala Lys Phe Lys  
 85 90 95



Asn Asn Phe Ile Asn Phe Ser Ser Ala Ile Gly Tyr Tyr Ser Gly Gln  
 100 105 110  
 Gly Pro Arg Leu Glu Ile Glu Ser Ser Tyr Gly Asp Phe Asp Val Val  
 115 120 125  
 Asn Tyr Lys Asn Tyr Ala Val Gln Asp Val Asn Arg Tyr Phe Ala Leu  
 130 135 140  
 Val Arg Glu Lys Asn Gly Ser Asn Phe Ser Pro Lys Pro His Glu Thr  
 145 150 155 160  
 Ser Gln Pro Ser Asp Ser Asn Pro Lys Lys Ser Phe Tyr Thr Leu Met  
 165 170 175  
 Lys Asn Asn Gly Val Phe Val Ala Ser Val Ile Ile Asn Gly Cys Tyr  
 180 185 190  
 Asp Phe Ser Phe Asn Asn Thr Thr Ile Ser Pro Tyr Val Cys Ile Gly  
 195 200 205  
 Val Gly Gly Asp Phe Ile Glu Phe Phe Glu Val Met His Ile Lys Phe  
 210 215 220  
 Ala Cys Gln Ser Lys Val Gly Ile Ser Tyr Pro Ile Ser Pro Ser Ile  
 225 230 235 240  
 Thr Ile Phe Ala Asp Ala His Tyr His Lys Val Ile Asn Asn Lys Phe  
 245 250 255  
 Asn Asn Leu His Val Lys Tyr Ser Tyr Glu Leu Lys Asn Ser Pro Thr  
 260 265 270  
 Ile Thr Ser Ala Thr Ala Lys Leu Asn Ile Glu Tyr Phe Gly Gly Glu  
 275 280 285  
 Val Gly Met Arg Phe Ile Phe  
 290 295

<210> 23  
 <211> 840  
 <212> DNA  
 <213> *Ehrlichia chaffeensis*

<400> 23  
 atgagcaaaa aaaagtttat tacaatagga acagtacttg catctctatt atcattctta 60  
 tctattgaat ccttttcagc tataaatcat aatcatacag gaaataacac tagtggtata 120  
 tatattacag ggcagtatag accaggagta tcccatttta gcaatttctc agtaaaagaa 180  
 actaatgttg atacaataca actagtagga tataaaaaaa gtgcgtcttc tatcgatcct 240  
 aacacttatt caaactttca aggtccatat actgttacat ttcaagataa tgctgctagt 300  
 ttcagtggag caattggata ttcttacctc gaaagtctaa gacttgaact tgaaggttct 360  
 tacgaaaaat ttgatgtcaa agatcctaaa gactactcag caaaagatgc ttttaggttt 420  
 tttgctctag cacgtaatac gtctactact gttcctgatg ctcaaaaata tacagttatg 480

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aagaataatg gcttatctgt tgcatacaatc atgatcaatg gttggttatga tctatctttt 540
aataatttag tcgtatcacc ttatatatgt gcagggtattg gtgaagattt cattgaattt 600
tttgatactt tgcacattaa acttgcttat caaggaaaaac taggtattag ttattacttc 660
tttcctaaga ttaatgtatt tgctggtggg tactatcata gagttatagg gaataaattt 720
aaaaatttaa atgttaacca tgttggttaca cttgatgaat ttcctaaagc aacttctgca 780
gtagctacac ttaatgttgc ttatttttggg ggtgaagctg gagtaaagtt tacatttttaa 840

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<210> 24

<211> 279

<212> PRT

<213> Ehrlichia chaffeensis

<400> 24

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Met Ser Lys Lys Lys Phe Ile Thr Ile Gly Thr Val Leu Ala Ser Leu
  1             5             10             15

Leu Ser Phe Leu Ser Ile Glu Ser Phe Ser Ala Ile Asn His Asn His
      20             25             30

Thr Gly Asn Asn Thr Ser Gly Ile Tyr Ile Thr Gly Gln Tyr Arg Pro
      35             40             45

Gly Val Ser His Phe Ser Asn Phe Ser Val Lys Glu Thr Asn Val Asp
      50             55             60

Thr Ile Gln Leu Val Gly Tyr Lys Lys Ser Ala Ser Ser Ile Asp Pro
      65             70             75             80

Asn Thr Tyr Ser Asn Phe Gln Gly Pro Tyr Thr Val Thr Phe Gln Asp
      85             90             95

Asn Ala Ala Ser Phe Ser Gly Ala Ile Gly Tyr Ser Tyr Pro Glu Ser
      100            105            110

Leu Arg Leu Glu Leu Glu Gly Ser Tyr Glu Lys Phe Asp Val Lys Asp
      115            120            125

Pro Lys Asp Tyr Ser Ala Lys Asp Ala Phe Arg Phe Phe Ala Leu Ala
      130            135            140

Arg Asn Thr Ser Thr Thr Val Pro Asp Ala Gln Lys Tyr Thr Val Met
      145            150            155            160

Lys Asn Asn Gly Leu Ser Val Ala Ser Ile Met Ile Asn Gly Cys Tyr
      165            170            175

Asp Leu Ser Phe Asn Asn Leu Val Val Ser Pro Tyr Ile Cys Ala Gly
      180            185            190

Ile Gly Glu Asp Phe Ile Glu Phe Phe Asp Thr Leu His Ile Lys Leu
      195            200            205

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Ala Tyr Gln Gly Lys Leu Gly Ile Ser Tyr Tyr Phe Phe Pro Lys Ile  
 210 215 220

Asn Val Phe Ala Gly Gly Tyr Tyr His Arg Val Ile Gly Asn Lys Phe  
 225 230 235 240

Lys Asn Leu Asn Val Asn His Val Val Thr Leu Asp Glu Phe Pro Lys  
 245 250 255

Ala Thr Ser Ala Val Ala Thr Leu Asn Val Ala Tyr Phe Gly Gly Glu  
 260 265 270

Ala Gly Val Lys Phe Thr Phe  
 275

<210> 25  
 <211> 852  
 <212> DNA  
 <213> Ehrlichia chaffeensis

<400> 25  
 atgagtgccta aaaaaaagct ttttataata gggtcagtgt tagtatgttt agtgtcatatc 60  
 ttacctacta aatctttgtc aaacttaaat aatattaata ataacactaa gtgcactggg 120  
 ctatatgtca gtggacaata taaacctact gtttctcact ttagtaattt ttcacttaaa 180  
 gaaacttata ctgacactaa agagttatta ggactagcaa aagatattaa gtctattaca 240  
 gatataacaa caaataaaaa attcaacatt ccttataaca caaaatttca agataatgct 300  
 gtttagcttca gtgcagctgt tggatatatt tcccaagaca gtccaagggt tgaggtagaa 360  
 tgggtcttatg aagaatttga cgttaaaaaat cctggtaatt acgtagtaag tgaagccttc 420  
 aggtatatgt ctttagcaag aggaattgat aatcttcaaa aatatacctga aacaaataag 480  
 tatgtttgta taaagaacaa tggcttatct gtcgcatcca ttataatcaa tggctgttat 540  
 gatttttctt taaacaattt aaaagtatca ccttacatat gcgtaggggt tgggtggggac 600  
 attatagaat ttttttagtgc tgtaagtttt aaatttgctt atcaaggtaa ggtaggtatc 660  
 agttatccat tattctctaa tatgattata tttgctgacg gatattacca taaggtcata 720  
 ggaaataaat ttaacaattt aaatgttcaa cacgttggtta gtcttaacag tcatcctaag 780  
 tctacttttg cagtagctac tcttaatggt gagtatttcg gtagtgaatt tgggttaaaa 840  
 tttatatattt aa 852

<210> 26  
 <211> 283  
 <212> PRT  
 <213> Ehrlichia chaffeensis

<400> 26  
 Met Ser Ala Lys Lys Lys Leu Phe Ile Ile Gly Ser Val Leu Val Cys  
 1 5 10 15

Leu Val Ser Tyr Leu Pro Thr Lys Ser Leu Ser Asn Leu Asn Asn Ile  
 20 25 30

Asn Asn Asn Thr Lys Cys Thr Gly Leu Tyr Val Ser Gly Gln Tyr Lys  
 35 40 45

Pro Thr Val Ser His Phe Ser Asn Phe Ser Leu Lys Glu Thr Tyr Thr  
 50 55 60  
 Asp Thr Lys Glu Leu Leu Gly Leu Ala Lys Asp Ile Lys Ser Ile Thr  
 65 70 75 80  
 Asp Ile Thr Thr Asn Lys Lys Phe Asn Ile Pro Tyr Asn Thr Lys Phe  
 85 90 95  
 Gln Asp Asn Ala Val Ser Phe Ser Ala Ala Val Gly Tyr Ile Ser Gln  
 100 105 110  
 Asp Ser Pro Arg Val Glu Val Glu Trp Ser Tyr Glu Glu Phe Asp Val  
 115 120 125  
 Lys Asn Pro Gly Asn Tyr Val Val Ser Glu Ala Phe Arg Tyr Ile Ala  
 130 135 140  
 Leu Ala Arg Gly Ile Asp Asn Leu Gln Lys Tyr Pro Glu Thr Asn Lys  
 145 150 155 160  
 Tyr Val Val Ile Lys Asn Asn Gly Leu Ser Val Ala Ser Ile Ile Ile  
 165 170 175  
 Asn Gly Cys Tyr Asp Phe Ser Leu Asn Asn Leu Lys Val Ser Pro Tyr  
 180 185 190  
 Ile Cys Val Gly Phe Gly Gly Asp Ile Ile Glu Phe Phe Ser Ala Val  
 195 200 205  
 Ser Phe Lys Phe Ala Tyr Gln Gly Lys Val Gly Ile Ser Tyr Pro Leu  
 210 215 220  
 Phe Ser Asn Met Ile Ile Phe Ala Asp Gly Tyr Tyr His Lys Val Ile  
 225 230 235 240  
 Gly Asn Lys Phe Asn Asn Leu Asn Val Gln His Val Val Ser Leu Asn  
 245 250 255  
 Ser His Pro Lys Ser Thr Phe Ala Val Ala Thr Leu Asn Val Glu Tyr  
 260 265 270  
 Phe Gly Ser Glu Phe Gly Leu Lys Phe Ile Phe  
 275 280

<210> 27  
 <211> 828  
 <212> DNA  
 <213> Ehrlichia chaffeensis

<400> 27  
 atgagtaaaa aaaattttat tacaatagga gcaacactta ttcatatggt gttacctaac 60  
 atatcttttc cagaaactat taacaataac actgataaac tttctgggtt atatataagt 120

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gggcaatata aaccagggat ttctcatttc agcaaatttt cagtcaaaga aatctataat 180
gataacattc aactaattgg gtttaagacac aacgcaattt ctactagtag ccttaatat 240
aatacagatt ttaatatccc ctataaagta acatttcaaa ataacattac cagctttagt 300
ggagctattg gttattctga tcccacaggg gcaagatttg agcttgaagg ttcttatgaa 360
gaatttgatg tgacagatcc tggagactgc ttaataaaaag atacctatag atatttcgct 420
ttagctagaa acccatcagg ttctagccct acctcaaaca actatactgt tatgagaaat 480
gatggtggtt ccattacttc tgttatattt aatggctgtt atgacatctt tttaaaggat 540
ttagaagtat caccttatgt atgtgttggg gtaggtggag attttataga attttttgac 600
gcattacaca ttaaattagc ataccaaggc aagttaggta tcaattatca cttatcgact 660
caagcaagcg tattttattga tggatattat cataagggtta taggaaatca attcaacaat 720
ctaaatgttc aacacgtggc tagtacagat tttggacctg tatacgcagt agccacactt 780
aacattgggtt attttgggtg tgaaatcgga attagactta catttttaa 828

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<210> 28
<211> 275
<212> PRT
<213> Ehrlichia chaffeensis

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<400> 28
Met Ser Lys Lys Asn Phe Ile Thr Ile Gly Ala Thr Leu Ile His Met
  1                      5                      10                      15

Leu Leu Pro Asn Ile Ser Phe Pro Glu Thr Ile Asn Asn Asn Thr Asp
          20                      25                      30

Lys Leu Ser Gly Leu Tyr Ile Ser Gly Gln Tyr Lys Pro Gly Ile Ser
          35                      40                      45

His Phe Ser Lys Phe Ser Val Lys Glu Ile Tyr Asn Asp Asn Ile Gln
          50                      55                      60

Leu Ile Gly Leu Arg His Asn Ala Ile Ser Thr Ser Thr Leu Asn Ile
          65                      70                      75                      80

Asn Thr Asp Phe Asn Ile Pro Tyr Lys Val Thr Phe Gln Asn Asn Ile
          85                      90                      95

Thr Ser Phe Ser Gly Ala Ile Gly Tyr Ser Asp Pro Thr Gly Ala Arg
          100                      105                      110

Phe Glu Leu Glu Gly Ser Tyr Glu Glu Phe Asp Val Thr Asp Pro Gly
          115                      120                      125

Asp Cys Leu Ile Lys Asp Thr Tyr Arg Tyr Phe Ala Leu Ala Arg Asn
          130                      135                      140

Pro Ser Gly Ser Ser Pro Thr Ser Asn Asn Tyr Thr Val Met Arg Asn
          145                      150                      155                      160

Asp Gly Val Ser Ile Thr Ser Val Ile Phe Asn Gly Cys Tyr Asp Ile
          165                      170                      175

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Phe Leu Lys Asp Leu Glu Val Ser Pro Tyr Val Cys Val Gly Val Gly  
 180 185 190  
 Gly Asp Phe Ile Glu Phe Phe Asp Ala Leu His Ile Lys Leu Ala Tyr  
 195 200 205  
 Gln Gly Lys Leu Gly Ile Asn Tyr His Leu Ser Thr Gln Ala Ser Val  
 210 215 220  
 Phe Ile Asp Gly Tyr Tyr His Lys Val Ile Gly Asn Gln Phe Asn Asn  
 225 230 235 240  
 Leu Asn Val Gln His Val Ala Ser Thr Asp Phe Gly Pro Val Tyr Ala  
 245 250 255  
 Val Ala Thr Leu Asn Ile Gly Tyr Phe Gly Gly Glu Ile Gly Ile Arg  
 260 265 270  
 Leu Thr Phe  
 275

<210> 29  
 <211> 858  
 <212> DNA  
 <213> Ehrlichia chaffeensis

<400> 29  
 atgaataata gaaaaagttt ttttataata ggtgcatcat tactagcaag cttattattc 60  
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 tataatcagt gacaatatag accaggagtt tctcatttta gcaaattttc agtcaaagaa 180  
 accaactaca atactactca actagttggg cttaaaaagg acatcagtgt cataggggaac 240  
 agtaatatca caacctacac aaatttcaac tttccttaca ttgcagaatt tcaagacaat 300  
 gccataagtt tcagtggggc aattgggatac ttgtattccg agaatttttag aattgaagta 360  
 gaggcttctt atgaagaatt tgatgttaaa aatccagaag gatctgctac agacgcatac 420  
 aggtattttg cactagcacg tgctatggat ggcaactaata aatctagtcc tgatgacaca 480  
 agaaaattca ctgtcatgag aaatgacggg ttatcaattt catcagtaat gataaatggg 540  
 tgttacaatt ttacattaga tgatatacca gtagtaccgt atgtatgcmc aggaatagga 600  
 ggagatttca tagagttttt taatgattta catgttaagt ttcgtcatca aggcaaggta 660  
 ggtattagtt attctatatc ccctgaagta agttttattt ttaacggata ttaccataaa 720  
 gtaacaggta acagatttaa aaacttacac gttcaacacg taagtgattt aagtgacgct 780  
 cctaagttca catctgcagt tgctacactc aatgttgggt actttgggtg cgaaattgga 840  
 gtaagattta tattttta 858

<210> 30  
 <211> 285  
 <212> PRT  
 <213> Ehrlichia chaffeensis

<400> 30  
 Met Asn Asn Arg Lys Ser Phe Phe Ile Ile Gly Ala Ser Leu Leu Ala  
 1 5 10 15

Ser Leu Leu Phe Thr Ser Glu Ala Ser Ser Thr Gly Asn Val Ser Asn  
                   20                  25                  30  
 His Thr Tyr Phe Lys Pro Arg Leu Tyr Ile Ser Gly Gln Tyr Arg Pro  
                   35                  40                  45  
 Gly Val Ser His Phe Ser Lys Phe Ser Val Lys Glu Thr Asn Tyr Asn  
                   50                  55                  60  
 Thr Thr Gln Leu Val Gly Leu Lys Lys Asp Ile Ser Val Ile Gly Asn  
                   65                  70                  75                  80  
 Ser Asn Ile Thr Thr Tyr Thr Asn Phe Asn Phe Pro Tyr Ile Ala Glu  
                                   85                  90                  95  
 Phe Gln Asp Asn Ala Ile Ser Phe Ser Gly Ala Ile Gly Tyr Leu Tyr  
                   100                  105                  110  
 Ser Glu Asn Phe Arg Ile Glu Val Glu Ala Ser Tyr Glu Glu Phe Asp  
                   115                  120                  125  
 Val Lys Asn Pro Glu Gly Ser Ala Thr Asp Ala Tyr Arg Tyr Phe Ala  
                   130                  135                  140  
 Leu Ala Arg Ala Met Asp Gly Thr Asn Lys Ser Ser Pro Asp Asp Thr  
                   145                  150                  155                  160  
 Arg Lys Phe Thr Val Met Arg Asn Asp Gly Leu Ser Ile Ser Ser Val  
                   165                  170                  175  
 Met Ile Asn Gly Cys Tyr Asn Phe Thr Leu Asp Asp Ile Pro Val Val  
                   180                  185                  190  
 Pro Tyr Val Cys Ala Gly Ile Gly Gly Asp Phe Ile Glu Phe Phe Asn  
                   195                  200                  205  
 Asp Leu His Val Lys Phe Arg His Gln Gly Lys Val Gly Ile Ser Tyr  
                   210                  215                  220  
 Ser Ile Ser Pro Glu Val Ser Leu Phe Leu Asn Gly Tyr Tyr His Lys  
                   225                  230                  235                  240  
 Val Thr Gly Asn Arg Phe Lys Asn Leu His Val Gln His Val Ser Asp  
                   245                  250                  255  
 Leu Ser Asp Ala Pro Lys Phe Thr Ser Ala Val Ala Thr Leu Asn Val  
                   260                  265                  270  
 Gly Tyr Phe Gly Gly Glu Ile Gly Val Arg Phe Ile Phe  
                   275                  280                  285

<210> 31  
 <211> 867  
 <212> DNA  
 <213> *Ehrlichia canis*

<400> 31  
 atgaattgca aaagatTTTT catagcaagt gcattgatat cactaatgtc tttcttacct 60  
 agcgtatctt tttctgaatc aatacatgaa gataatataa atggtaactt ttacattagt 120  
 gcaaagtata tgccaagtgc ctcacacttt ggcgtatTTT cagttaaaga agagaaaaac 180  
 acaacaactg gagttttcgg attaaaacaa gattgggacg gagcaacaat aaaggatgca 240  
 agcagcagcc acacaataga cccaagtaca atattctcca tttcaaatta ttcattttaa 300  
 tatgaaaaca atccattttt agggtttgca ggagctattg gctactcaat gggtggtcca 360  
 agggtagagt ttgaagtgtc ttacgaaata tttgatgtaa aaaaccaagg taacagttac 420  
 aagaacgatg ctcacaaata ttgcgcttta tcaagacaca ccggaggtat gccacaagcc 480  
 gggtcatcaa ataaatttTgt cttcctaaaa aatgaaggat tacttgacat atcacttatg 540  
 ataaacgcat gttatgatat aacaatcgac agcatgccat tttctccata tatatgtgca 600  
 ggtattggta gtgacttagt ttcgatgttt gaaactacaa atcctaaaat ttcttatcaa 660  
 ggaaaattag gtgtaagtta ctccataagc ccagaagcat ctgtttttTgt tggaggacac 720  
 tttcacagag ttataggtaa tgaattttaa gacattcctg caataactcc tgctggagca 780  
 acagaaatta aaggcacaca gtttacaaca gtaacattaa acatatgcca cttcggacta 840  
 gagcttggag gcaggtttac ttttttaa 867

<210> 32  
 <211> 288  
 <212> PRT  
 <213> *Ehrlichia canis*

<400> 32  
 Met Asn Cys Lys Arg Phe Phe Ile Ala Ser Ala Leu Ile Ser Leu Met  
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 Ser Phe Leu Pro Ser Val Ser Phe Ser Glu Ser Ile His Glu Asp Asn  
 20 25 30  
 Ile Asn Gly Asn Phe Tyr Ile Ser Ala Lys Tyr Met Pro Ser Ala Ser  
 35 40 45  
 His Phe Gly Val Phe Ser Val Lys Glu Glu Lys Asn Thr Thr Thr Gly  
 50 55 60  
 Val Phe Gly Leu Lys Gln Asp Trp Asp Gly Ala Thr Ile Lys Asp Ala  
 65 70 75 80  
 Ser Ser Ser His Thr Ile Asp Pro Ser Thr Ile Phe Ser Ile Ser Asn  
 85 90 95  
 Tyr Ser Phe Lys Tyr Glu Asn Asn Pro Phe Leu Gly Phe Ala Gly Ala  
 100 105 110  
 Ile Gly Tyr Ser Met Gly Gly Pro Arg Val Glu Phe Glu Val Ser Tyr  
 115 120 125



Glu Ile Phe Asp Val Lys Asn Gln Gly Asn Ser Tyr Lys Asn Asp Ala  
 130 135 140  
 His Lys Tyr Cys Ala Leu Ser Arg His Thr Gly Gly Met Pro Gln Ala  
 145 150 155 160  
 Gly His Gln Asn Lys Phe Val Phe Leu Lys Asn Glu Gly Leu Leu Asp  
 165 170 175  
 Ile Ser Leu Met Ile Asn Ala Cys Tyr Asp Ile Thr Ile Asp Ser Met  
 180 185 190  
 Pro Phe Ser Pro Tyr Ile Cys Ala Gly Ile Gly Ser Asp Leu Val Ser  
 195 200 205  
 Met Phe Glu Thr Thr Asn Pro Lys Ile Ser Tyr Gln Gly Lys Leu Gly  
 210 215 220  
 Val Ser Tyr Ser Ile Ser Pro Glu Ala Ser Val Phe Val Gly Gly His  
 225 230 235 240  
 Phe His Arg Val Ile Gly Asn Glu Phe Lys Asp Ile Pro Ala Ile Thr  
 245 250 255  
 Pro Ala Gly Ala Thr Glu Ile Lys Gly Thr Gln Phe Thr Thr Val Thr  
 260 265 270  
 Leu Asn Ile Cys His Phe Gly Leu Glu Leu Gly Gly Arg Phe Thr Phe  
 275 280 285

<210> 33  
 <211> 864  
 <212> DNA  
 <213> *Ehrlichia chaffeensis*

<400> 33  
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 aaatatatgc caacagcgtc acatttttggg atttttttcag ctaaagaaga acaaagtttt 180  
 actaaggtag tagttgggtt agatcaacga ttatcacata atattataaa caataatgat 240  
 acagcaaaga gtcttaaggt tcaaaattat tcattttaa ataaaaataa cccattttcta 300  
 ggatttgcaa gagctattgg ttattcaata ggcaattcaa gaatagaact agaagtatca 360  
 catgaaatat ttgatactaa aaaccaggga aacaattatt taaatgactc tcacaaatat 420  
 tgcgctttat ctcattggaag tcacatatgc agtgatggaa atagcggaga ttggtacact 480  
 gcaaaaaactg ataagtttgt acttctgaaa aatgaagggt tacttgacgt ctcatattatg 540  
 ttaaacgcat gttatgacat aacaactgaa aaaatgcctt tttcacctta tatatgtgca 600  
 ggtattggta ctgatctcat atctatgttt gagacaacac aaaacaaaat atcttatcaa 660  
 ggaaagttag gtttaaacta tactataaac tcaagagttt ctgtttttgc aggtggggcac 720  
 tttcataaag taataggtta tgaatttaaa ggtattccta ctctattacc tgatggatca 780  
 aacattaaag tacaacagtc tgcaacagta acattagatg tgtgccattt cggggttagag 840  
 attggaagta gattttttctt ttaa 864

<210> 34  
 <211> 287  
 <212> PRT  
 <213> Ehrlichia chaffeensis

<400> 34  
 Met Lys Tyr Lys Lys Thr Phe Thr Val Thr Ala Leu Val Leu Leu Thr  
   1                  5                  10                  15  
 Ser Phe Thr His Phe Ile Pro Phe Tyr Ser Pro Ala Arg Ala Ser Thr  
           20                  25                  30  
 Ile His Asn Phe Tyr Ile Ser Gly Lys Tyr Met Pro Thr Ala Ser His  
           35                  40                  45  
 Phe Gly Ile Phe Ser Ala Lys Glu Glu Gln Ser Phe Thr Lys Val Leu  
   50                  55                  60  
 Val Gly Leu Asp Gln Arg Leu Ser His Asn Ile Ile Asn Asn Asn Asp  
   65                  70                  75                  80  
 Thr Ala Lys Ser Leu Lys Val Gln Asn Tyr Ser Phe Lys Tyr Lys Asn  
           85                  90                  95  
 Asn Pro Phe Leu Gly Phe Ala Arg Ala Ile Gly Tyr Ser Ile Gly Asn  
          100                 105                 110  
 Ser Arg Ile Glu Leu Glu Val Ser His Glu Ile Phe Asp Thr Lys Asn  
   115                 120                 125  
 Pro Gly Asn Asn Tyr Leu Asn Asp Ser His Lys Tyr Cys Ala Leu Ser  
   130                 135                 140  
 His Gly Ser His Ile Cys Ser Asp Gly Asn Ser Gly Asp Trp Tyr Thr  
  145                 150                 155                 160  
 Ala Lys Thr Asp Lys Phe Val Leu Leu Lys Asn Glu Gly Leu Leu Asp  
          165                 170                 175  
 Val Ser Phe Met Leu Asn Ala Cys Tyr Asp Ile Thr Thr Glu Lys Met  
          180                 185                 190  
 Pro Phe Ser Pro Tyr Ile Cys Ala Gly Ile Gly Thr Asp Leu Ile Ser  
          195                 200                 205  
 Met Phe Glu Thr Thr Gln Asn Lys Ile Ser Tyr Gln Gly Lys Leu Gly  
   210                 215                 220  
 Leu Asn Tyr Thr Ile Asn Ser Arg Val Ser Val Phe Ala Gly Gly His  
  225                 230                 235                 240  
 Phe His Lys Val Ile Gly Asn Glu Phe Lys Gly Ile Pro Thr Leu Leu  
          245                 250                 255

Pro Asp Gly Ser Asn Ile Lys Val Gln Gln Ser Ala Thr Val Thr Leu  
 260 265 270

Asp Val Cys His Phe Gly Leu Glu Ile Gly Ser Arg Phe Phe Phe  
 275 280 285

<210> 35  
 <211> 924  
 <212> DNA  
 <213> Ehrlichia canis

<400> 35  
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 ttaatatcat taatgtactc tattccaagc atatcttttt ctgatactat acaagatggg 180  
 aacatgggtg gtaacttcta tattagtgga aagtatgtac caagtgtctc acattttggg 240  
 agcttctcag ctaaagaaga aagcaaatca actggtggag tttttggatt aaaacatgat 300  
 tgggatggaa gtccaatact taagaataaa cacgctgact ttactgttcc aaactattcg 360  
 ttcagatacg agaacaatcc atttctaggg tttgcaggag ctatcgggta ctcaatgggt 420  
 ggcccaagaa tagaattcga aatatcttat gaagcattcg acgtaaaaag tcctaatatc 480  
 aattatcaaa atgacgcgca cagggtactgc gctctatctc atcacacatc ggcagccatg 540  
 gaagctgata aatttgtctt cttaaaaaac gaagggttaa ttgacatatc acttgcaata 600  
 aatgcatgtt atgatataat aaatgacaaa gtacctgttt ctccttatat atgcgaggt 660  
 attggtactg atttgatttc tatgtttgaa gctacaagtc ctaaaatttc ctaccaagga 720  
 aaactgggca ttagttactc tattaatccg gaaacctctg ttttcacggt tgggcatttc 780  
 cacaggatca taggtaatga gtttagagat attcctgcaa tagtacctag taactcaact 840  
 acaataagtg gaccacaatt tgcaacagta acactaaatg tgtgtcactt tgggttagaa 900  
 cttggaggaa gatttaactt ctaa 924

<210> 36  
 <211> 307  
 <212> PRT  
 <213> Ehrlichia canis

<400> 36  
 Met Phe Tyr Thr Asn Ile Tyr Ile Leu Ala Cys Ile Tyr Phe Ala Leu  
 1 5 10 15  
 Pro Leu Leu Leu Ile Tyr Phe His Tyr Phe Arg Cys Asn Met Asn Cys  
 20 25 30  
 Lys Lys Ile Leu Ile Thr Thr Ala Leu Ile Ser Leu Met Tyr Ser Ile  
 35 40 45  
 Pro Ser Ile Ser Phe Ser Asp Thr Ile Gln Asp Gly Asn Met Gly Gly  
 50 55 60  
 Asn Phe Tyr Ile Ser Gly Lys Tyr Val Pro Ser Val Ser His Phe Gly  
 65 70 75 80

Ser Phe Ser Ala Lys Glu Glu Ser Lys Ser Thr Val Gly Val Phe Gly  
                   85                  90                  95  
 Leu Lys His Asp Trp Asp Gly Ser Pro Ile Leu Lys Asn Lys His Ala  
                   100                  105                  110  
 Asp Phe Thr Val Pro Asn Tyr Ser Phe Arg Tyr Glu Asn Asn Pro Phe  
                   115                  120                  125  
 Leu Gly Phe Ala Gly Ala Ile Gly Tyr Ser Met Gly Gly Pro Arg Ile  
                   130                  135                  140  
 Glu Phe Glu Ile Ser Tyr Glu Ala Phe Asp Val Lys Ser Pro Asn Ile  
                   145                  150                  155                  160  
 Asn Tyr Gln Asn Asp Ala His Arg Tyr Cys Ala Leu Ser His His Thr  
                   165                  170                  175  
 Ser Ala Ala Met Glu Ala Asp Lys Phe Val Phe Leu Lys Asn Glu Gly  
                   180                  185                  190  
 Leu Ile Asp Ile Ser Leu Ala Ile Asn Ala Cys Tyr Asp Ile Ile Asn  
                   195                  200                  205  
 Asp Lys Val Pro Val Ser Pro Tyr Ile Cys Ala Gly Ile Gly Thr Asp  
                   210                  215                  220  
 Leu Ile Ser Met Phe Glu Ala Thr Ser Pro Lys Ile Ser Tyr Gln Gly  
                   225                  230                  235                  240  
 Lys Leu Gly Ile Ser Tyr Ser Ile Asn Pro Glu Thr Ser Val Phe Ile  
                   245                  250                  255  
 Gly Gly His Phe His Arg Ile Ile Gly Asn Glu Phe Arg Asp Ile Pro  
                   260                  265                  270  
 Ala Ile Val Pro Ser Asn Ser Thr Thr Ile Ser Gly Pro Gln Phe Ala  
                   275                  280                  285  
 Thr Val Thr Leu Asn Val Cys His Phe Gly Leu Glu Leu Gly Gly Arg  
                   290                  295                  300  
 Phe Asn Phe  
 305

<210> 37  
 <211> 843  
 <212> DNA  
 <213> Ehrlichia canis

<400> 37  
 atgaattgca aaaaaattct tataacaact gcattaatgt cattaatgta ctatgctcca 60  
 agcatatctt tttctgatac tataacaagac gataacactg gtagcttcta catcagtggg 120

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aaatatgtac caagtgtttc acattttggt gttttctcag ctaaagaaga aagaaactca 180
actgttggag tttttggatt aaaacatgat tggaatggag gtacaatatc taactcttct 240
ccagaaaata tattcacagt tcaaaattat tcgtttaaat acgaaaacaa cccattctta 300
gggtttgcag gagctattgg ttattcaatg ggtggcccaa gaatagaact tgaagtcttg 360
tacgagacat tcgatgtgaa aaatcagaac aataattata agaacggcgc acacagatac 420
tgtgctttat ctcatcatag ttcagcaaca aacatgtcct ccgcaagtaa caaatttggt 480
ttcttaaaaa atgaagggtt aattgactta tcatttatga taaatgcatg ctatgacata 540
ataattgaag gaatgccttt ttcaccttat atttgtgcag gtgttggtac tgatgttggt 600
tccatgtttg aagctataaa tcctaaaatt tcttaccagg gaaaactagg attaggttat 660
agtataagtt cagaagcctc tgtttttatt ggtggacact ttcacagagt cataggtaat 720
gaatttagag acatccctgc tatggttcct agtggatcaa atcttcaga aaaccaattt 780
gcaatagtaa cactaaatgt gtgtcacttt ggtttagaac ttggaggaag atttaacttc 840
tga
843

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<210> 38

<211> 280

<212> PRT

<213> *Ehrlichia canis*

<400> 38

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Met Asn Cys Lys Lys Ile Leu Ile Thr Thr Ala Leu Met Ser Leu Met
  1              5              10              15

Tyr Tyr Ala Pro Ser Ile Ser Phe Ser Asp Thr Ile Gln Asp Asp Asn
      20              25              30

Thr Gly Ser Phe Tyr Ile Ser Gly Lys Tyr Val Pro Ser Val Ser His
      35              40              45

Phe Gly Val Phe Ser Ala Lys Glu Glu Arg Asn Ser Thr Val Gly Val
      50              55              60

Phe Gly Leu Lys His Asp Trp Asn Gly Gly Thr Ile Ser Asn Ser Ser
      65              70              75              80

Pro Glu Asn Ile Phe Thr Val Gln Asn Tyr Ser Phe Lys Tyr Glu Asn
      85              90              95

Asn Pro Phe Leu Gly Phe Ala Gly Ala Ile Gly Tyr Ser Met Gly Gly
      100              105              110

Pro Arg Ile Glu Leu Glu Val Leu Tyr Glu Thr Phe Asp Val Lys Asn
      115              120              125

Gln Asn Asn Asn Tyr Lys Asn Gly Ala His Arg Tyr Cys Ala Leu Ser
      130              135              140

His His Ser Ser Ala Thr Asn Met Ser Ser Ala Ser Asn Lys Phe Val
      145              150              155              160

Phe Leu Lys Asn Glu Gly Leu Ile Asp Leu Ser Phe Met Ile Asn Ala
      165              170              175

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Cys Tyr Asp Ile Ile Ile Glu Gly Met Pro Phe Ser Pro Tyr Ile Cys  
 180 185 190

Ala Gly Val Gly Thr Asp Val Val Ser Met Phe Glu Ala Ile Asn Pro  
 195 200 205

Lys Ile Ser Tyr Gln Gly Lys Leu Gly Leu Gly Tyr Ser Ile Ser Ser  
 210 215 220

Glu Ala Ser Val Phe Ile Gly Gly His Phe His Arg Val Ile Gly Asn  
 225 230 235 240

Glu Phe Arg Asp Ile Pro Ala Met Val Pro Ser Gly Ser Asn Leu Pro  
 245 250 255

Glu Asn Gln Phe Ala Ile Val Thr Leu Asn Val Cys His Phe Gly Leu  
 260 265 270

Glu Leu Gly Gly Arg Phe Asn Phe  
 275 280

<210> 39

<211> 852

<212> DNA

<213> Ehrlichia canis

<400> 39

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aatgtctcat actctaacc agtatatggt aacagtatgt atggtaattt ttacatatca 120
ggaaagtaca tgccaagtgt tcctcatttt ggaatttttt cagctgaaga agagaaaaaa 180
aagacaactg tagtatatgg cttaaaagga aaactggcag gagatgcaat atctagtcaa 240
agtccagatg ataattttac cattcgaaat tactcattca agtatgcaag caacaagttt 300
ttaggggttg cagtagctat tggttactcg ataggcagtc caagaataga agttgagatg 360
tcttatgaag catttgatgt gaaaaatcca ggtgataatt acaaaaacgg tgcttacagg 420
tattgtgctt tatctcatca agatgatgcg gatgatgaca tgactagtgc aactgacaaa 480
tttgtatatt taattaatga aggattactt aacatatcat ttatgacaaa catatgttat 540
gaaacagcaa gcaaaaatat acctctctct cttacatat gtgcagggtat tgggtactgat 600
ttaattcaca tgtttgaaac tacacatcct aaaatttctt atcaaggaaa gctaggggttg 660
gcctacttcg taagtgcaga gtcttcgggtt tcttttggtt tatattttca taaaattata 720
aataataagt ttaaaaatgt tccagccatg gtacctatta actcagacga gatagtagga 780
ccacagtttg caacagtaac attaaatgta tgctactttg gattagaact tggatgtagg 840
ttcaacttct aa 852

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<210> 40

<211> 283

<212> PRT

<213> Ehrlichia canis

<400> 40

Met Asn Cys Lys Lys Val Phe Thr Ile Ser Ala Leu Ile Ser Ser Ile  
 1 5 10 15

Tyr Phe Leu Pro Asn Val Ser Tyr Ser Asn Pro Val Tyr Gly Asn Ser  
                   20                  25                  30  
 Met Tyr Gly Asn Phe Tyr Ile Ser Gly Lys Tyr Met Pro Ser Val Pro  
                   35                  40                  45  
 His Phe Gly Ile Phe Ser Ala Glu Glu Glu Lys Lys Lys Thr Thr Val  
           50                  55                  60  
 Val Tyr Gly Leu Lys Gly Lys Leu Ala Gly Asp Ala Ile Ser Ser Gln  
           65                  70                  75                  80  
 Ser Pro Asp Asp Asn Phe Thr Ile Arg Asn Tyr Ser Phe Lys Tyr Ala  
                   85                  90                  95  
 Ser Asn Lys Phe Leu Gly Phe Ala Val Ala Ile Gly Tyr Ser Ile Gly  
                   100                  105                  110  
 Ser Pro Arg Ile Glu Val Glu Met Ser Tyr Glu Ala Phe Asp Val Lys  
                   115                  120                  125  
 Asn Pro Gly Asp Asn Tyr Lys Asn Gly Ala Tyr Arg Tyr Cys Ala Leu  
           130                  135                  140  
 Ser His Gln Asp Asp Ala Asp Asp Asp Met Thr Ser Ala Thr Asp Lys  
   145                  150                  155                  160  
 Phe Val Tyr Leu Ile Asn Glu Gly Leu Leu Asn Ile Ser Phe Met Thr  
                   165                  170                  175  
 Asn Ile Cys Tyr Glu Thr Ala Ser Lys Asn Ile Pro Leu Ser Pro Tyr  
                   180                  185                  190  
 Ile Cys Ala Gly Ile Gly Thr Asp Leu Ile His Met Phe Glu Thr Thr  
           195                  200                  205  
 His Pro Lys Ile Ser Tyr Gln Gly Lys Leu Gly Leu Ala Tyr Phe Val  
           210                  215                  220  
 Ser Ala Glu Ser Ser Val Ser Phe Gly Ile Tyr Phe His Lys Ile Ile  
   225                  230                  235                  240  
 Asn Asn Lys Phe Lys Asn Val Pro Ala Met Val Pro Ile Asn Ser Asp  
                   245                  250                  255  
 Glu Ile Val Gly Pro Gln Phe Ala Thr Val Thr Leu Asn Val Cys Tyr  
           260                  265                  270  
 Phe Gly Leu Glu Leu Gly Cys Arg Phe Asn Phe  
           275                  280

<210> 41  
 <211> 831  
 <212> DNA  
 <213> *Ehrlichia canis*

<400> 41  
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 ggaaaaatatg taccaagtat ttcacatttt gggaactttt cagctaaaga agaaaaaac 180  
 acaactactg gaatttttgg attaaaagaa tcatggactg gtggtatcat ccttgataaa 240  
 gaacatgcag cttttaatat cccaaattat tcatttaaata atgaaaataa tccattttta 300  
 ggatttgcag gggtaattgg ctattcaata ggtagtccaa gaatagaatt tgaagtatca 360  
 tacgagacat tcgatgtaca aaatccagga gataagttta acaatgatgc acataagtat 420  
 tgtgctttat ccaatgattc cagtaaaaca atgaaaagtg gtaaattcgt ttttctcaaa 480  
 aatgaaggat taagtgcac atcactcatg ttaaatgtat gttatgatat aataaacaaa 540  
 agaatgcctt tttcacctta catatgtgca ggcattggta ctgacttaat attcatgttt 600  
 gacgctataa accataaagc tgcttatcaa ggaaaattag gttttaatta tccaataagc 660  
 ccagaagcta acattttctat ggggtgtgcac tttcacaaag taacaaacaa cgagtttaga 720  
 gttcctgttc tattaactgc tggaggactc gctccagata atctatttgc aatagtaaag 780  
 ttgagtatat gtcatttttg gttagaattt gggtagcagg tcagttttta a 831

<210> 42  
 <211> 276  
 <212> PRT  
 <213> *Ehrlichia canis*

<400> 42  
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 20 25 30  
 Thr Thr Gly Asn Phe Tyr Ile Ile Gly Lys Tyr Val Pro Ser Ile Ser  
 35 40 45  
 His Phe Gly Asn Phe Ser Ala Lys Glu Glu Lys Asn Thr Thr Thr Gly  
 50 55 60  
 Ile Phe Gly Leu Lys Glu Ser Trp Thr Gly Gly Ile Ile Leu Asp Lys  
 65 70 75 80  
 Glu His Ala Ala Phe Asn Ile Pro Asn Tyr Ser Phe Lys Tyr Glu Asn  
 85 90 95  
 Asn Pro Phe Leu Gly Phe Ala Gly Val Ile Gly Tyr Ser Ile Gly Ser  
 100 105 110  
 Pro Arg Ile Glu Phe Glu Val Ser Tyr Glu Thr Phe Asp Val Gln Asn  
 115 120 125  
 Pro Gly Asp Lys Phe Asn Asn Asp Ala His Lys Tyr Cys Ala Leu Ser  
 130 135 140



Asn Asp Ser Ser Lys Thr Met Lys Ser Gly Lys Phe Val Phe Leu Lys  
 145 150 155 160  
 Asn Glu Gly Leu Ser Asp Ile Ser Leu Met Leu Asn Val Cys Tyr Asp  
 165 170 175  
 Ile Ile Asn Lys Arg Met Pro Phe Ser Pro Tyr Ile Cys Ala Gly Ile  
 180 185 190  
 Gly Thr Asp Leu Ile Phe Met Phe Asp Ala Ile Asn His Lys Ala Ala  
 195 200 205  
 Tyr Gln Gly Lys Leu Gly Phe Asn Tyr Pro Ile Ser Pro Glu Ala Asn  
 210 215 220  
 Ile Ser Met Gly Val His Phe His Lys Val Thr Asn Asn Glu Phe Arg  
 225 230 235 240  
 Val Pro Val Leu Leu Thr Ala Gly Gly Leu Ala Pro Asp Asn Leu Phe  
 245 250 255  
 Ala Ile Val Lys Leu Ser Ile Cys His Phe Gly Leu Glu Phe Gly Tyr  
 260 265 270  
 Arg Val Ser Phe  
 275

<210> 43  
 <211> 882  
 <212> DNA  
 <213> Ehrlichia canis

<400> 43  
 atgaataata aactcaaatt tactataata aacacagtat tagtatgctt attgtcatta 60  
 cctaataatat cttcctcaaa ggccataaac aataacgcta aaaagtacta cggattatat 120  
 atcagtgagc aatataaacc cagtgtttct gttttcagta atttttcagt taaagaaacc 180  
 aatgtcataa ctaaaaacct tatagcttta aaaaaagatg ttgactctat tgaaaccaag 240  
 actgatgcca gtgtaggtat tagtaaccca tcaaatttta ctatccccta tacagctgta 300  
 tttcaagata attctgtcaa tttcaatgga actattgggt acacctttgc tgaagggtaca 360  
 agagttgaaa tagaagggtc ttatgaggaa tttgatgtta aaaaccctgg aggctataca 420  
 ctaagtgatg cctatcgcta ttttgcatta gcacgtgaaa tgaaaggtaa tagttttaca 480  
 cctaaagaaa aagttttcta tagttttttt cacactgtaa tgagaaatga tggattatct 540  
 ataatatctg ttatagtaaa tgtttgctac gatttctctt tgaacaattt gtcaatatcg 600  
 ccttacatat gtggaggagc aggggtagat gctatagaat tcttcgatgt attacacatt 660  
 aagtttgc atcaaagcaa gctagggtatt gcttattctc taccatctaa cattagtctc 720  
 tttgctagtt tatattacca taaagtaatg ggcaatcaat ttaaaaattt aaatgtccaa 780  
 gatgttgctg aacttgcaag tatacctaaa attacatccg cagttgctac acttaatat 840  
 ggttattttg gaggtgaaat tgggtgcaaga ttgacatttt aa 882

&lt;210&gt; 44

&lt;211&gt; 293

&lt;212&gt; PRT

&lt;213&gt; Ehrlichia canis

&lt;400&gt; 44

Met Asn Asn Lys Leu Lys Phe Thr Ile Ile Asn Thr Val Leu Val Cys  
 1 5 10 15

Leu Leu Ser Leu Pro Asn Ile Ser Ser Ser Lys Ala Ile Asn Asn Asn  
 20 25 30

Ala Lys Lys Tyr Tyr Gly Leu Tyr Ile Ser Gly Gln Tyr Lys Pro Ser  
 35 40 45

Val Ser Val Phe Ser Asn Phe Ser Val Lys Glu Thr Asn Val Ile Thr  
 50 55 60

Lys Asn Leu Ile Ala Leu Lys Lys Asp Val Asp Ser Ile Glu Thr Lys  
 65 70 75 80

Thr Asp Ala Ser Val Gly Ile Ser Asn Pro Ser Asn Phe Thr Ile Pro  
 85 90 95

Tyr Thr Ala Val Phe Gln Asp Asn Ser Val Asn Phe Asn Gly Thr Ile  
 100 105 110

Gly Tyr Thr Phe Ala Glu Gly Thr Arg Val Glu Ile Glu Gly Ser Tyr  
 115 120 125

Glu Glu Phe Asp Val Lys Asn Pro Gly Gly Tyr Thr Leu Ser Asp Ala  
 130 135 140

Tyr Arg Tyr Phe Ala Leu Ala Arg Glu Met Lys Gly Asn Ser Phe Thr  
 145 150 155 160

Pro Lys Glu Lys Val Ser Asn Ser Phe Phe His Thr Val Met Arg Asn  
 165 170 175

Asp Gly Leu Ser Ile Ile Ser Val Ile Val Asn Val Cys Tyr Asp Phe  
 180 185 190

Ser Leu Asn Asn Leu Ser Ile Ser Pro Tyr Ile Cys Gly Gly Ala Gly  
 195 200 205

Val Asp Ala Ile Glu Phe Phe Asp Val Leu His Ile Lys Phe Ala Tyr  
 210 215 220

Gln Ser Lys Leu Gly Ile Ala Tyr Ser Leu Pro Ser Asn Ile Ser Leu  
 225 230 235 240

Phe Ala Ser Leu Tyr Tyr His Lys Val Met Gly Asn Gln Phe Lys Asn  
 245 250 255

Leu Asn Val Gln Asp Val Ala Glu Leu Ala Ser Ile Pro Lys Ile Thr  
 260 265 270

Ser Ala Val Ala Thr Leu Asn Ile Gly Tyr Phe Gly Gly Glu Ile Gly  
 275 280 285

Ala Arg Leu Thr Phe  
 290

<210> 45  
 <211> 900  
 <212> DNA  
 <213> Ehrlichia canis

<400> 45  
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 cctaacacat ctctctcaaa cttcataggc aatagtacaa aacattctgg attatatgtt 120  
 agcggacatt ataagcccag cgtttccatt tttagcaaat tttcagtaaa agaaacaaat 180  
 acacatacag tacagttagt agctcttaaa aaagatggtta attctatttc tatgaacatc 240  
 agtaatggtg ctacaggcat tagcaaaagca acaaatttta atcttcctta tgttgcagaa 300  
 tttcaagaca atgccttcaa cttcagtggg gctattgggtt attcactttt tgaacaacta 360  
 aacattgaag ttgaagggtt ttatgaagaa ttcgatgcc aaaaatcctgg tgggttatatt 420  
 ttaaagtatg cattccgcta ttttgcattg gcacgtgaaa tgggacaaga aaaaaatgat 480  
 aataagcatc ttagtcctaa ggaggagcat gatataagta aaacatatta cacagtcattg 540  
 agaaataatg gggtatctat attatctatt atgataaatg gctgctataa tctacctctc 600  
 aatgatttat caatatcacc ttatttttgt acaggaatag gtgtagatgc tatagaattt 660  
 tttgatgcac tgcattctaa acttgctttg caaagtaaaa taggagctac ttaccaatta 720  
 tcagacaaca ttagttttatt tacaatgga tattaccatc aagtaatagg tgatcaattt 780  
 aaaaacttaa aagtccaata tataggtgaa cttaaagaga acccgaaaat tacatctgca 840  
 gttgctactc tcaatggttg atactttgga ggtgaaattg gagtaagact cacacttta 900

<210> 46  
 <211> 299  
 <212> PRT  
 <213> Ehrlichia canis

<400> 46  
 Met Asn Ser Lys Ser Lys Phe Phe Thr Ile Cys Thr Ser Leu Ile Cys  
 1 5 10 15  
 Leu Leu Ser Ser Pro Asn Thr Ser Leu Ser Asn Phe Ile Gly Asn Ser  
 20 25 30  
 Thr Lys His Ser Gly Leu Tyr Val Ser Gly His Tyr Lys Pro Ser Val  
 35 40 45  
 Ser Ile Phe Ser Lys Phe Ser Val Lys Glu Thr Asn Thr His Thr Val  
 50 55 60  
 Gln Leu Val Ala Leu Lys Lys Asp Val Asn Ser Ile Ser Met Asn Ile  
 65 70 75 80

Ser Asn Gly Ala Thr Gly Ile Ser Lys Ala Thr Asn Phe Asn Leu Pro  
                             85                            90                            95  
 Tyr Val Ala Glu Phe Gln Asp Asn Ala Phe Asn Phe Ser Gly Ala Ile  
                             100                            105                            110  
 Gly Tyr Ser Leu Phe Glu Gln Leu Asn Ile Glu Val Glu Gly Ser Tyr  
                             115                            120                            125  
 Glu Glu Phe Asp Ala Lys Asn Pro Gly Gly Tyr Ile Leu Asn Asp Ala  
                             130                            135                            140  
 Phe Arg Tyr Phe Ala Leu Ala Arg Glu Met Gly Gln Glu Lys Asn Asp  
                             145                            150                            155                            160  
 Asn Lys His Leu Ser Pro Lys Glu Glu His Asp Ile Ser Lys Thr Tyr  
                             165                            170                            175  
 Tyr Thr Val Met Arg Asn Asn Gly Leu Ser Ile Leu Ser Ile Met Ile  
                             180                            185                            190  
 Asn Gly Cys Tyr Asn Leu Pro Leu Asn Asp Leu Ser Ile Ser Pro Tyr  
                             195                            200                            205  
 Phe Cys Thr Gly Ile Gly Val Asp Ala Ile Glu Phe Phe Asp Ala Leu  
                             210                            215                            220  
 His Leu Lys Leu Ala Leu Gln Ser Lys Ile Gly Ala Thr Tyr Gln Leu  
                             225                            230                            235                            240  
 Ser Asp Asn Ile Ser Leu Phe Thr Asn Gly Tyr Tyr His Gln Val Ile  
                             245                            250                            255  
 Gly Asp Gln Phe Lys Asn Leu Lys Val Gln Tyr Ile Gly Glu Leu Lys  
                             260                            265                            270  
 Glu Asn Pro Lys Ile Thr Ser Ala Val Ala Thr Leu Asn Val Gly Tyr  
                             275                            280                            285  
 Phe Gly Gly Glu Ile Gly Val Arg Leu Thr Leu  
                             290                            295

&lt;210&gt; 47

&lt;211&gt; 843

&lt;212&gt; DNA

&lt;213&gt; Ehrlichia canis

&lt;400&gt; 47

atgaattata agaaaattct agtaagaagc gcgtaaatct cattaatgtc aatcttacca 60  
 tatcagtctt ttgcagatcc tgtagggtca agaactaatg ataacaaaga aggcttctac 120  
 attagtgc aaagtacaatcc aagtatatca cacttttagaa aattctctgc tgaagaaact 180  
 cctattaatg gaacaaattc tctcactaaa aaagttttcg gactaaagaa agatgggtgat 240  
 ataacaaaaa aagacgattt tacaagagta gctccaggca ttgattttca aaataactta 300

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atatcaggat tttcaggaag tattgggttac tctatggacg gaccaagaat agaacttgaa 360
gctgcataac aacaatttaa tccaaaaaac accgataaca atgatactga taatgggtgaa 420
tactataaac attttgcatt atctcgtaaa gatgcaatgg aagatcagca atatgtagta 480
cttaaaaaatg acggcataac ttttatgtca ttgatgggta atacttgcta tgacattaca 540
gctgaaggag tatctttcgt accatatgca tgtgcaggta taggagcaga tcttatcact 600
atTTTTaaag acctcaatct aaaatttgct taccaaggaa aaatagggtat tagttaccct 660
atcacaccag aagtctctgc atttattggt ggatactacc atggcggtat tggtaataaa 720
tttgagaaga tacctgtaat aactcctgta gtattaaatg atgctcctca aaccacatct 780
gcttcagtaa ctcttgacgt tggatacttt ggcggagaaa ttggaatgag gttcaccttc 840
taa

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&lt;210&gt; 48

&lt;211&gt; 280

&lt;212&gt; PRT

&lt;213&gt; Ehrlichia canis

&lt;400&gt; 48

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Met Asn Tyr Lys Lys Ile Leu Val Arg Ser Ala Leu Ile Ser Leu Met
  1              5              10              15

Ser Ile Leu Pro Tyr Gln Ser Phe Ala Asp Pro Val Gly Ser Arg Thr
      20              25              30

Asn Asp Asn Lys Glu Gly Phe Tyr Ile Ser Ala Lys Tyr Asn Pro Ser
      35              40              45

Ile Ser His Phe Arg Lys Phe Ser Ala Glu Glu Thr Pro Ile Asn Gly
      50              55              60

Thr Asn Ser Leu Thr Lys Lys Val Phe Gly Leu Lys Lys Asp Gly Asp
      65              70              75              80

Ile Thr Lys Lys Asp Asp Phe Thr Arg Val Ala Pro Gly Ile Asp Phe
      85              90              95

Gln Asn Asn Leu Ile Ser Gly Phe Ser Gly Ser Ile Gly Tyr Ser Met
      100              105              110

Asp Gly Pro Arg Ile Glu Leu Glu Ala Ala Tyr Gln Gln Phe Asn Pro
      115              120              125

Lys Asn Thr Asp Asn Asn Asp Thr Asp Asn Gly Glu Tyr Tyr Lys His
      130              135              140

Phe Ala Leu Ser Arg Lys Asp Ala Met Glu Asp Gln Gln Tyr Val Val
      145              150              155              160

Leu Lys Asn Asp Gly Ile Thr Phe Met Ser Leu Met Val Asn Thr Cys
      165              170              175

Tyr Asp Ile Thr Ala Glu Gly Val Ser Phe Val Pro Tyr Ala Cys Ala
      180              185              190

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Gly Ile Gly Ala Asp Leu Ile Thr Ile Phe Lys Asp Leu Asn Leu Lys  
           195                                  200                                  205  
 Phe Ala Tyr Gln Gly Lys Ile Gly Ile Ser Tyr Pro Ile Thr Pro Glu  
           210                                  215                                  220  
 Val Ser Ala Phe Ile Gly Gly Tyr Tyr His Gly Val Ile Gly Asn Lys  
           225                                  230                                  235                                  240  
 Phe Glu Lys Ile Pro Val Ile Thr Pro Val Val Leu Asn Asp Ala Pro  
                                   245                                  250                                  255  
 Gln Thr Thr Ser Ala Ser Val Thr Leu Asp Val Gly Tyr Phe Gly Gly  
                                   260                                  265                                  270  
 Glu Ile Gly Met Arg Phe Thr Phe  
           275                                  280

<210> 49  
 <211> 903  
 <212> DNA  
 <213> Ehrlichia chaffeensis

<400> 49  
 atgaagaaga aaaatcaatt tatcacaata agtacaatat tagtatgttt attgtcatta 60  
 tctaattgcat cactttcaaa cactacaaat agcagcacta aaaaacagtt tgggttatat 120  
 gttagtggac aatacaagcc tagtggttct atttttagca atttctcagt aaaggaaact 180  
 aattttccta caaagtatct agcagctctt aaaaaagaca ttaattctgt cgaatttgac 240  
 gatagtgtta ctgctggcat tagttaccca cttaatttca gtactcctta tatagctgta 300  
 tttcaagata atatttctaa ttttaatggc gctattgggt acacttttgt tgaaggccca 360  
 agaattgaaa tagaagggtc ttatgaagaa ttcgatgtca aagacctgga agatatacag 420  
 aaatacaaga tgcataccgt tgactttgct ttagcacgtg atatagactc tattcctact 480  
 agcccaaaaa atagaacttc acatgatggc aacagttcat ataagggtata ccacactgta 540  
 atgaaaaatg aaggactatc tataatatcc attatgggtca atggctgcta tgatttttct 600  
 tcagataatt tatcaatatt accttatgta tgtgggtggt taggtgtaaa tgctatagag 660  
 tttttcgatg cattacatgt taaattcgcg tgtcagggtg aattaggtat tacttatcca 720  
 ttatcttcca acgtagtggg atttgctggg ggatattatc accaagtaat gggcaaccac 780  
 tttaaaaatc taaatgttca acatgtagct gaacttaatg acgcacccaa agttacatct 840  
 gcagtagcta cacttgacat tgggtatttt ggtgggtgaa ttggagcaag gcttatattt 900  
 taa 903

<210> 50  
 <211> 300  
 <212> PRT  
 <213> Ehrlichia chaffeensis

<400> 50  
 Met Lys Lys Lys Asn Gln Phe Ile Thr Ile Ser Thr Ile Leu Val Cys  
       1                                  5                                  10                                  15  
 Leu Leu Ser Leu Ser Asn Ala Ser Leu Ser Asn Thr Thr Asn Ser Ser  
                                   20                                  25                                  30

Thr Lys Lys Gln Phe Gly Leu Tyr Val Ser Gly Gln Tyr Lys Pro Ser  
 35 40 45  
 Val Ser Ile Phe Ser Asn Phe Ser Val Lys Glu Thr Asn Phe Pro Thr  
 50 55 60  
 Lys Tyr Leu Ala Ala Leu Lys Lys Asp Ile Asn Ser Val Glu Phe Asp  
 65 70 75 80  
 Asp Ser Val Thr Ala Gly Ile Ser Tyr Pro Leu Asn Phe Ser Thr Pro  
 85 90 95  
 Tyr Ile Ala Val Phe Gln Asp Asn Ile Ser Asn Phe Asn Gly Ala Ile  
 100 105 110  
 Gly Tyr Thr Phe Val Glu Gly Pro Arg Ile Glu Ile Glu Gly Ser Tyr  
 115 120 125  
 Glu Glu Phe Asp Val Lys Asp Leu Glu Asp Ile Gln Lys Tyr Lys Met  
 130 135 140  
 His Thr Val Asp Phe Ala Leu Ala Arg Asp Ile Asp Ser Ile Pro Thr  
 145 150 155 160  
 Ser Pro Lys Asn Arg Thr Ser His Asp Gly Asn Ser Ser Tyr Lys Val  
 165 170 175  
 Tyr His Thr Val Met Lys Asn Glu Gly Leu Ser Ile Ile Ser Ile Met  
 180 185 190  
 Val Asn Gly Cys Tyr Asp Phe Ser Ser Asp Asn Leu Ser Ile Leu Pro  
 195 200 205  
 Tyr Val Cys Gly Gly Ile Gly Val Asn Ala Ile Glu Phe Phe Asp Ala  
 210 215 220  
 Leu His Val Lys Phe Ala Cys Gln Gly Lys Leu Gly Ile Thr Tyr Pro  
 225 230 235 240  
 Leu Ser Ser Asn Val Ser Leu Phe Ala Gly Gly Tyr Tyr His Gln Val  
 245 250 255  
 Met Gly Asn Gln Phe Lys Asn Leu Asn Val Gln His Val Ala Glu Leu  
 260 265 270  
 Asn Asp Ala Pro Lys Val Thr Ser Ala Val Ala Thr Leu Asp Ile Gly  
 275 280 285  
 Tyr Phe Gly Gly Glu Ile Gly Ala Arg Leu Ile Phe  
 290 295 300

<210> 51  
 <211> 897  
 <212> DNA  
 <213> *Ehrlichia chaffeensis*

<400> 51  
 atgaatcaca aaagtatgct ctttacaata ggtacagctt tgatatacctt attgtcatta 60  
 cctaattgtat cattctcagg aatcataaat aacaatgcta acaatttagg tatatacatt 120  
 agtgggcaat ataaaccag tgtttctgtt tttagcaatt tctcagtaaa agaaactaac 180  
 ttcactacac aacagttagt agcacttaaa aaagatattg attctgttga cattagtacc 240  
 aatgctgata gcggtattaa taatccgcag aatttcacta tcccttatat accaaaattt 300  
 caagacaatg ctgctagttt tagtggagca cttggattct tctacgctag aggtttaaga 360  
 cttgaaatgg aaggttccta tgaagaattt gatgttaaaa accctggagg atatacaaaa 420  
 gtaaaagatg catatcgtaa ctttgccctg gcacgtgaga tgcaatctgg tcaaacttgc 480  
 cctaaacaca aagaaacatc aggtattcaa cctcacggta tttatcacac tggtatgagg 540  
 aatgatgggg tatctatttc atctgtcata atcaatgggt gttataactt tactttaagt 600  
 aatctaccaa tatcacctta catgtgtgta ggtatgggaa tagatgctat acaatttttt 660  
 gattcactac atattaagtt tgcacatcaa agtaagttag gtattactta cccactatct 720  
 tcaaagtgtc atttatttgc tgatagctat tatcataaag taataggtaa taaatttaaa 780  
 aatctaaggg ttcaacacgt ttatgaatta caacaggtac cttaaagttac atctgctgtt 840  
 gctacacttg atattgggta ttttggtggt gaagttggag taaggtttat actttaaa 897

<210> 52  
 <211> 298  
 <212> PRT  
 <213> *Ehrlichia chaffeensis*

<400> 52  
 Met Asn His Lys Ser Met Leu Phe Thr Ile Gly Thr Ala Leu Ile Ser  
 1 5 10 15  
 Leu Leu Ser Leu Pro Asn Val Ser Phe Ser Gly Ile Ile Asn Asn Asn  
 20 25 30  
 Ala Asn Asn Leu Gly Ile Tyr Ile Ser Gly Gln Tyr Lys Pro Ser Val  
 35 40 45  
 Ser Val Phe Ser Asn Phe Ser Val Lys Glu Thr Asn Phe Thr Thr Gln  
 50 55 60  
 Gln Leu Val Ala Leu Lys Lys Asp Ile Asp Ser Val Asp Ile Ser Thr  
 65 70 75 80  
 Asn Ala Asp Ser Gly Ile Asn Asn Pro Gln Asn Phe Thr Ile Pro Tyr  
 85 90 95  
 Ile Pro Lys Phe Gln Asp Asn Ala Ala Ser Phe Ser Gly Ala Leu Gly  
 100 105 110  
 Phe Phe Tyr Ala Arg Gly Leu Arg Leu Glu Met Glu Gly Ser Tyr Glu  
 115 120 125



Glu Phe Asp Val Lys Asn Pro Gly Gly Tyr Thr Lys Val Lys Asp Ala  
 130 135 140  
 Tyr Arg Tyr Phe Ala Leu Ala Arg Glu Met Gln Ser Gly Gln Thr Cys  
 145 150 155 160  
 Pro Lys His Lys Glu Thr Ser Gly Ile Gln Pro His Gly Ile Tyr His  
 165 170 175  
 Thr Val Met Arg Asn Asp Gly Val Ser Ile Ser Ser Val Ile Ile Asn  
 180 185 190  
 Gly Cys Tyr Asn Phe Thr Leu Ser Asn Leu Pro Ile Ser Pro Tyr Met  
 195 200 205  
 Cys Val Gly Met Gly Ile Asp Ala Ile Gln Phe Phe Asp Ser Leu His  
 210 215 220  
 Ile Lys Phe Ala His Gln Ser Lys Leu Gly Ile Thr Tyr Pro Leu Ser  
 225 230 235 240  
 Ser Asn Val His Leu Phe Ala Asp Ser Tyr Tyr His Lys Val Ile Gly  
 245 250 255  
 Asn Lys Phe Lys Asn Leu Arg Val Gln His Val Tyr Glu Leu Gln Gln  
 260 265 270  
 Val Pro Lys Val Thr Ser Ala Val Ala Thr Leu Asp Ile Gly Tyr Phe  
 275 280 285  
 Gly Gly Glu Val Gly Val Arg Phe Ile Leu  
 290 295

<210> 53  
 <211> 882  
 <212> DNA  
 <213> *Ehrlichia canis*

<400> 53  
 atggcaaatt ttatgtacaa aaaatacaaa ctaatgacag caggtgtagt attatttcac 60  
 atgttatttc tacctcatgt ttctttcgca aaaaatacaa acagcaataa acttggatta 120  
 tacatcagtg gacagtataa ccctagtgtt tctgttttta gcaatttttc agcaaaagaa 180  
 accaatgttc atacagtaca actcatggcg cttaaaaaag acattgattc tattgaagtt 240  
 gatactggaa atagcgcagg tattagcaaa ccacaaaatt tcacagttct ttatactcca 300  
 aaatttcaag ataatgttgc tggctcttagc ggtgcacttg gattctttta ttctaaagga 360  
 ttaaggattg aaatgggggtt ttcttatgaa aaatttgatg cttaaagacct tggtaggtac 420  
 accaaaataa aagatgctta tagatatttt gctctagtac gtgaaatgca tgttagtctc 480  
 atttatccaa aagataataa cacaggaaca cattatactg ttatgagaaa tgatgggtata 540  
 tctattttct ctgctacagt aaatggctgc tatgattctt ttttccagtt tatctttgtc 600  
 acctatatgt gtataggcat cggtatagat gctatagaat ttcttaatgc atacatatta 660  
 agtttgcttg ccaaggtagt taagggtgta acttattctg tatctcccaa tgtaatttta 720  
 tttgcagatg gatattatca taaagtgatg ggcaataaat ttaaaaattt acctgttcaa 780  
 tacgttaata ctttagaaga gtatccaaga gttacatctg caattgctac acttgatatt 840

ggctacctcg gtgggtgaaat tggcataaga tttatatattt aa

882

<210> 54

<211> 293

<212> PRT

<213> Ehrlichia canis

<400> 54

Met Ala Asn Phe Met Tyr Lys Lys Tyr Lys Leu Met Thr Ala Gly Val  
1 5 10 15

Val Leu Phe His Met Leu Phe Leu Pro His Val Ser Phe Ala Lys Asn  
20 25 30

Thr Asn Ser Asn Lys Leu Gly Leu Tyr Ile Ser Gly Gln Tyr Asn Pro  
35 40 45

Ser Val Ser Val Phe Ser Asn Phe Ser Ala Lys Glu Thr Asn Val His  
50 55 60

Thr Val Gln Leu Met Ala Leu Lys Lys Asp Ile Asp Ser Ile Glu Val  
65 70 75 80

Asp Thr Gly Asn Ser Ala Gly Ile Ser Lys Pro Gln Asn Phe Thr Val  
85 90 95

Leu Tyr Thr Pro Lys Phe Gln Asp Asn Val Ala Gly Leu Ser Gly Ala  
100 105 110

Leu Gly Phe Phe Tyr Ser Lys Gly Leu Arg Ile Glu Met Gly Phe Ser  
115 120 125

Tyr Glu Lys Phe Asp Ala Lys Asp Leu Gly Glu Tyr Thr Lys Ile Lys  
130 135 140

Asp Ala Tyr Arg Tyr Phe Ala Leu Val Arg Glu Met His Val Ser Leu  
145 150 155 160

Ile Tyr Pro Lys Asp Asn Asn Thr Gly Thr His Tyr Thr Val Met Arg  
165 170 175

Asn Asp Gly Ile Ser Ile Ser Ser Ala Thr Val Asn Gly Cys Tyr Asp  
180 185 190

Ser Phe Phe Gln Phe Ile Phe Val Thr Tyr Met Cys Ile Gly Ile Gly  
195 200 205

Ile Asp Ala Ile Glu Phe Leu Asn Ala Tyr Ile Leu Ser Leu Leu Ala  
210 215 220

Lys Val Val Lys Val Leu Thr Tyr Ser Val Ser Pro Asn Val Asn Leu  
225 230 235 240

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<210> 55
<211> 891
<212> DNA
<213> Ehrlichia canis
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<400> 55							
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tatattagcg	ggcaatacaa	accagtggt	tctgttttca	gtaatttttc	agttaaagaa	180	
accaactttc	atacaaaaaca	tctcatagct	cttaaacaaag	atgttgattc	tggtgaaatt	240	
gatactggta	gtaatacagc	aggattagtg	aacctcatca	actttacaat	cccttatact	300	
gcagaatttc	aagacaacca	tactaactgc	aatggctcta	ttggttatgc	ttttgctgaa	360	
ggtccaagaa	ttgaaataga	attatcatat	gaaaaatttg	atgttaaaaa	tcccacaggg	420	
tatactacag	taaaagatgc	ttatagatac	tttgctttag	cacgtgaaat	aaatatattc	480	
ctattccaac	caaaacaaaa	agaaggtagt	ggaatttacc	atgtcgtaat	gaaaaacgat	540	
gggttatcta	tcttatccaa	tatagttaat	atttgctacg	atTTTTcttt	aaataattta	600	
cctatatcac	cttattttatg	cggaggaatg	ggtataaatg	ccatagaact	ctttgacgct	660	
ttacatgtga	aattttgctta	tcaaagcaag	gcaggaatta	ggtatcaact	attacgtaaa	720	
atcaactttat	ttattgatgt	atattactac	gaagtaataa	gtaataaatt	taaaaacctg	780	
aaagttcaac	atgtacatga	acttaagat	aatccaaaag	tcacatctgc	agttgctaca	840	
cttgatatag	catatttttg	tagtgaagct	ggcataagaa	ttatatTTta	a	891	

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<210> 56
<211> 296
<212> PRT
<213> Ehrlichia canis
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<400> 56
Met Gly Asn Ser Met Asn Asn Lys Ser Gln Phe Leu Ile Arg Phe Ile
  1             5             10             15

Phe Leu Thr Cys Met Leu Ser Leu Pro Asn Ile Ser Leu Ser Lys Val
      20             25             30

Asn Asn Glu Lys His Ser Gly Leu Tyr Ile Ser Gly Gln Tyr Lys Pro
      35             40             45

Ser Val Ser Val Phe Ser Asn Phe Ser Val Lys Glu Thr Asn Phe His
  50             55             60

```

Thr Lys His Leu Ile Ala Leu Lys Gln Asp Val Asp Ser Val Glu Ile  
 65 70 75 80  
 Asp Thr Gly Ser Asn Thr Ala Gly Ile Ser Asn Pro Ser Asn Phe Thr  
 85 90 95  
 Ile Pro Tyr Thr Ala Glu Phe Gln Asp Asn His Thr Asn Cys Asn Gly  
 100 105 110  
 Ser Ile Gly Tyr Ala Phe Ala Glu Gly Pro Arg Ile Glu Ile Glu Leu  
 115 120 125  
 Ser Tyr Glu Lys Phe Asp Val Lys Asn Pro Thr Gly Tyr Thr Thr Val  
 130 135 140  
 Lys Asp Ala Tyr Arg Tyr Phe Ala Leu Ala Arg Glu Ile Asn Ile Ser  
 145 150 155 160  
 Leu Phe Gln Pro Lys Gln Lys Glu Gly Ser Gly Ile Tyr His Val Val  
 165 170 175  
 Met Lys Asn Asp Gly Leu Ser Ile Leu Ser Asn Ile Val Asn Ile Cys  
 180 185 190  
 Tyr Asp Phe Ser Leu Asn Asn Leu Pro Ile Ser Pro Tyr Leu Cys Gly  
 195 200 205  
 Gly Met Gly Ile Asn Ala Ile Glu Phe Phe Asp Ala Leu His Val Lys  
 210 215 220  
 Phe Ala Tyr Gln Ser Lys Ala Gly Ile Ser Tyr Gln Leu Leu Arg Lys  
 225 230 235 240  
 Ile Asn Leu Phe Ile Asp Val Tyr Tyr Tyr Glu Val Ile Ser Asn Lys  
 245 250 255  
 Phe Lys Asn Leu Lys Val Gln His Val His Glu Leu Lys Asp Asn Pro  
 260 265 270  
 Lys Val Thr Ser Ala Val Ala Thr Leu Asp Ile Ala Tyr Phe Gly Ser  
 275 280 285  
 Glu Ala Gly Ile Arg Ile Ile Phe  
 290 295

<210> 57

<211> 846

<212> DNA

<213> Ehrlichia canis

<400> 57

atgaataata aaagaaattt tttttaata ggtatgtctc tattgataaa tctactattg 60  
 ccaattgatg cctcttctat ggaagtagat aattatacac attttacacc taggctgtat 120

```

attagtgggc aatacaggcc aggagtttcc cacttttagca aatttttcagt caaagaaaca 180
cattgtaata ctgtgcaatt agttgggcta acaaaagata taaaagtaac taataacagt 240
agtatcaaca caaatactag ttttaacttt ccttatgttg cagaatttca agataacgca 300
atgagcttta gtggagcaat aggatgcttt tattcagaac acttcagaat tgaagtagaa 360
gcttcttatg aagaatttga cgttaaaaat cctgaaggat ctactacaga ctcctataga 420
tatttcgcgt tagcacgtgg catggatggg aataatattc ctacaagtca aaaattttact 480
gtaatgagaa acgacgggtt attaattctca tctgttatga taaatggctg ttacaatgtc 540
atactaaatg atatacaagc agaaccttac atatgtgcag gactaggagg agattttata 600
gaattcttca atggctttca tgtaagcta gcttatcaag gtaaagtagg cattagttat 660
caaataattcc ctgaagtaag attattttatt gatggatact accataaagt aaaaggcaac 720
aagtttaaaa atttacacgt tcaacatgta ggtgcacttg cagcactccc taaagttaca 780
tctgcagttg caacacttaa tattggatac tttggttgtg aagctggagt aagattcata 840
ttttaa 846

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<210> 58

<211> 281

<212> PRT

<213> Ehrlichia canis

<400> 58

```

Met Asn Asn Lys Arg Asn Phe Phe Leu Ile Gly Met Ser Leu Leu Ile
  1              5              10              15

Asn Leu Leu Leu Pro Ile Asp Ala Ser Ser Met Glu Val His Asn Tyr
      20              25              30

Thr His Phe Thr Pro Arg Leu Tyr Ile Ser Gly Gln Tyr Arg Pro Gly
      35              40              45

Val Ser His Phe Ser Lys Phe Ser Val Lys Glu Thr His Cys Asn Thr
      50              55              60

Val Gln Leu Val Gly Leu Thr Lys Asp Ile Lys Val Thr Asn Asn Ser
      65              70              75              80

Ser Ile Asn Thr Asn Thr Ser Phe Asn Phe Pro Tyr Val Ala Glu Phe
      85              90              95

Gln Asp Asn Ala Met Ser Phe Ser Gly Ala Ile Gly Cys Phe Tyr Ser
      100              105              110

Glu His Phe Arg Ile Glu Val Glu Ala Ser Tyr Glu Glu Phe Asp Val
      115              120              125

Lys Asn Pro Glu Gly Ser Thr Thr Asp Ser Tyr Arg Tyr Phe Ala Leu
      130              135              140

Ala Arg Gly Met Asp Gly Asn Asn Ile Pro Thr Ser Gln Lys Phe Thr
      145              150              155              160

Val Met Arg Asn Asp Gly Leu Leu Ile Ser Ser Val Met Ile Asn Gly
      165              170              175

```

Cys Tyr Asn Val Ile Leu Asn Asp Ile Gln Ala Glu Pro Tyr Ile Cys  
 180 185 190

Ala Gly Leu Gly Gly Asp Phe Ile Glu Phe Phe Asn Gly Phe His Val  
 195 200 205

Lys Leu Ala Tyr Gln Gly Lys Val Gly Ile Ser Tyr Gln Ile Phe Pro  
 210 215 220

Glu Val Arg Leu Phe Ile Asp Gly Tyr Tyr His Lys Val Lys Gly Asn  
 225 230 235 240

Lys Phe Lys Asn Leu His Val Gln His Val Gly Ala Leu Ala Ala Leu  
 245 250 255

Pro Lys Val Thr Ser Ala Val Ala Thr Leu Asn Ile Gly Tyr Phe Gly  
 260 265 270

Cys Glu Ala Gly Val Arg Phe Ile Phe  
 275 280

<210> 59

<211> 840

<212> DNA

<213> Ehrlichia canis

<400> 59

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atgaacaaaa agaaaattat tacagtagga acaacattag cttattttatt attatcacct 60
aacatatctt tttcagaagt aatcaacaat gatactgata aatattctag actatatata 120
agtgggtcaat ataaaccagg attttcttatt ttaataaagt tctcagttag agaaactgat 180
catttcacta aagcattaat aggattaaga catgacgcaa tatctactaa aaatttaaca 240
actaatacag atttcaatac tctttataaaa gtaacatttc aaaacaacat cattagcttt 300
agcgggtgcta ttgggttattc tgatagcaca ggtgtaaggt ttgagctaga aggctcttat 360
gaagagttcg atgttacaga ccctggagat tgtataataa aagatactta cagggtacttt 420
gcattagcta gaaaaacaag tggtaatcat cccaacgata atggggaata tactgtcatg 480
agaaatgatg gagtatccat tacctccgtt atattcaatg gttggtatga tctctcttta 540
aaagagctag aaatatcacc atatgtttgc attggtatcg gaggagactt tatagaattt 600
tttgatgctt tacacattaa attagcatat caaggtaaag taggtattag ctattctttt 660
tccactagaa caaattttatt tatcgattgt tattaccata gagttatagg taatcaattt 720
aataatttaa atgttcaaca tgtagttgag cttacagaag cacctaaagc tacatctgca 780
attgctacac ttaatgttag ttacttcggt ggagaagttg gaattagact tatgttttaa 840

```

<210> 60

<211> 279

<212> PRT

<213> Ehrlichia canis

<400> 60

Met Asn Lys Lys Lys Ile Ile Thr Val Gly Thr Thr Leu Ala Tyr Leu  
 1 5 10 15

Leu Leu Ser Pro Asn Ile Ser Phe Ser Glu Val Ile Asn Asn Asp Thr  
                   20                  25                  30  
 Asp Lys Tyr Ser Arg Leu Tyr Ile Ser Gly Gln Tyr Lys Pro Gly Phe  
           35                  40                  45  
 Ser Tyr Phe Asn Lys Phe Ser Val Arg Glu Thr Asp His Phe Thr Lys  
           50                  55                  60  
 Ala Leu Ile Gly Leu Arg His Asp Ala Ile Ser Thr Lys Asn Leu Thr  
       65                  70                  75                  80  
 Thr Asn Thr Asp Phe Asn Thr Leu Tyr Lys Val Thr Phe Gln Asn Asn  
                   85                  90                  95  
 Ile Ile Ser Phe Ser Gly Ala Ile Gly Tyr Ser Asp Ser Thr Gly Val  
           100                  105                  110  
 Arg Phe Glu Leu Glu Gly Ser Tyr Glu Glu Phe Asp Val Thr Asp Pro  
           115                  120                  125  
 Gly Asp Cys Ile Ile Lys Asp Thr Tyr Arg Tyr Phe Ala Leu Ala Arg  
       130                  135                  140  
 Lys Thr Ser Gly Asn His Pro Asn Asp Asn Gly Glu Tyr Thr Val Met  
   145                  150                  155                  160  
 Arg Asn Asp Gly Val Ser Ile Thr Ser Val Ile Phe Asn Gly Cys Tyr  
           165                  170                  175  
 Asp Leu Ser Leu Lys Glu Leu Glu Ile Ser Pro Tyr Val Cys Ile Gly  
           180                  185                  190  
 Ile Gly Gly Asp Phe Ile Glu Phe Phe Asp Ala Leu His Ile Lys Leu  
           195                  200                  205  
 Ala Tyr Gln Gly Lys Leu Gly Ile Ser Tyr Ser Phe Ser Thr Arg Thr  
       210                  215                  220  
 Asn Leu Phe Ile Asp Cys Tyr Tyr His Arg Val Ile Gly Asn Gln Phe  
   225                  230                  235                  240  
 Asn Asn Leu Asn Val Gln His Val Val Glu Leu Thr Glu Ala Pro Lys  
           245                  250                  255  
 Ala Thr Ser Ala Ile Ala Thr Leu Asn Val Ser Tyr Phe Gly Gly Glu  
           260                  265                  270  
 Val Gly Ile Arg Leu Met Phe  
       275

<210> 61  
 <211> 726  
 <212> DNA  
 <213> Ehrlichia canis

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<400> 61
cccgtcggtt ctcattacag tgacttttca attaaagaaa cttataactaa cactgaggca 60
ttgtttggtt taaaacaaga tattagttct attttacgta ataaagagac cacacaatat 120
aataacaatt ttaacgttcc ctatactgca aaatttcaag acgactttgc gagtttcagc 180
atagctgttg gatataattgc taacaatggt ccaagaattg aaatagaagg atcttacgaa 240
gaatttgatg ttaaaaaccc aggaaattat acaacaatag atgctcatag gtacattgct 300
ttagctagag aaaaaacttc ttactatcta agttctccta aagaaaacaa atatgtaatt 360
ataaagaata acggcatatc tattgtatct attataatta atggttgtta tgatatttct 420
ttaaagtatt ctaaggtgtc accttacata tgcacagggt ttggtggaga ttttatagag 480
tttttttagt ctatacgttt taagtttgct tatcaaggta aaataggtat cagttattca 540
ttatcttcta acataatttt atttactgat ggatattacc acaaggtaat aaattcccaa 600
tttaaaaatt taaatgttga acatgttggt aatgagttaa ctacagatcc taaagtgact 660
tctgcaacag catttcttaa tattgagtat tttggtggtg aatttggatt aaaatttata 720
ttttaa

```

<210> 62  
 <211> 241  
 <212> PRT  
 <213> Ehrlichia canis

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<400> 62
Pro Val Val Ser His Tyr Ser Asp Phe Ser Ile Lys Glu Thr Tyr Thr
  1              5              10              15

Asn Thr Glu Ala Leu Phe Gly Leu Lys Gln Asp Ile Ser Ser Ile Leu
      20              25              30

Arg Asn Lys Glu Thr Thr Gln Tyr Asn Asn Asn Phe Asn Val Pro Tyr
      35              40              45

Thr Ala Lys Phe Gln Asp Asp Phe Ala Ser Phe Ser Ile Ala Val Gly
      50              55              60

Tyr Ile Ala Asn Asn Gly Pro Arg Ile Glu Ile Glu Gly Ser Tyr Glu
      65              70              75              80

Glu Phe Asp Val Lys Asn Pro Gly Asn Tyr Thr Thr Ile Asp Ala His
      85              90              95

Arg Tyr Ile Ala Leu Ala Arg Glu Lys Thr Ser Tyr Tyr Leu Ser Ser
      100             105             110

Pro Lys Glu Asn Lys Tyr Val Ile Ile Lys Asn Asn Gly Ile Ser Ile
      115             120             125

Val Ser Ile Ile Ile Asn Gly Cys Tyr Asp Ile Ser Leu Asn Asp Ser
      130             135             140

```



Lys Val Ser Pro Tyr Ile Cys Thr Gly Phe Gly Gly Asp Phe Ile Glu  
 145 150 155 160  
 Phe Phe Ser Ala Ile Arg Phe Lys Phe Ala Tyr Gln Gly Lys Ile Gly  
 165 170 175  
 Ile Ser Tyr Ser Leu Ser Ser Asn Ile Ile Leu Phe Thr Asp Gly Tyr  
 180 185 190  
 Tyr His Lys Val Ile Asn Ser Gln Phe Lys Asn Leu Asn Val Glu His  
 195 200 205  
 Val Val Asn Glu Leu Thr Thr Asp Pro Lys Val Thr Ser Ala Thr Ala  
 210 215 220  
 Phe Leu Asn Ile Glu Tyr Phe Gly Gly Glu Phe Gly Leu Lys Phe Ile  
 225 230 235 240  
 Phe

<210> 63  
 <211> 19  
 <212> PRT  
 <213> Ehrlichia chaffeensis

<400> 63  
 Asp Pro Ala Gly Ser Gly Ile Asn Gly Asn Phe Tyr Ile Ser Gly Lys  
 1 5 10 15

Tyr Met Pro

<210> 64  
 <211> 34  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: Synthetic  
 primer

<220>  
 <221> modified\_base  
 <222> (17)  
 <223> a, c, g or t

<220>  
 <221> modified\_base  
 <222> (26)  
 <223> a, c, g or t

<400> 64  
cgggatccga attcgggnath aayggnaayt tyta

34

<210> 65  
<211> 30  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic  
primer

<400> 65  
agcggccgct taraayasra aycttsctcc

30

<210> 66  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic  
primer

<400> 66  
acctaacttt ccttggttaag

20

<210> 67  
<211> 281  
<212> PRT  
<213> Ehrlichia chaffeensis

<400> 67  
Met Asn Tyr Lys Lys Val Phe Ile Thr Ser Ala Leu Ile Ser Leu Ile  
1 5 10 15  
Ser Ser Leu Pro Gly Val Ser Phe Ser Asp Pro Ala Gly Ser Gly Ile  
20 25 30  
Asn Gly Asn Phe Tyr Ile Ser Gly Lys Tyr Met Pro Ser Ala Ser His  
35 40 45  
Phe Gly Val Phe Ser Ala Lys Glu Glu Arg Asn Thr Thr Val Gly Val  
50 55 60  
Phe Gly Leu Lys Gln Asn Trp Asp Gly Ser Ala Ile Ser Asn Ser Ser  
65 70 75 80  
Pro Asn Asp Val Phe Thr Val Ser Asn Tyr Ser Phe Lys Tyr Glu Asn  
85 90 95

Asn Pro Phe Leu Gly Phe Ala Gly Ala Ile Gly Tyr Ser Met Asp Gly  
 100 105 110  
 Pro Arg Ile Glu Leu Glu Val Ser Tyr Glu Thr Phe Asp Val Lys Asn  
 115 120 125  
 Gln Gly Asn Asn Tyr Lys Asn Glu Ala His Arg Tyr Cys Ala Leu Ser  
 130 135 140  
 His Asn Ser Ala Ala Asp Met Ser Ser Ala Ser Asn Asn Phe Val Phe  
 145 150 155 160  
 Leu Lys Asn Glu Gly Leu Leu Asp Ile Ser Phe Met Leu Asn Ala Cys  
 165 170 175  
 Tyr Asp Val Val Gly Glu Gly Ile Pro Phe Ser Pro Tyr Ile Cys Ala  
 180 185 190  
 Gly Ile Gly Thr Asp Leu Val Ser Met Phe Glu Ala Thr Asn Pro Lys  
 195 200 205  
 Ile Ser Tyr Gln Gly Lys Leu Gly Leu Ser Tyr Ser Ile Ser Pro Glu  
 210 215 220  
 Ala Ser Val Phe Ile Gly Gly His Phe His Lys Val Leu Gly Asn Glu  
 225 230 235 240  
 Phe Arg Asp Ile Pro Thr Ile Ile Pro Thr Gly Ser Thr Leu Ala Gly  
 245 250 255  
 Lys Gly Asn Tyr Pro Ala Ile Val Ile Leu Asp Val Cys His Phe Gly  
 260 265 270  
 Ile Glu Leu Gly Gly Arg Phe Val Phe  
 275 280

<210> 68  
 <211> 756  
 <212> DNA  
 <213> Ehrlichia chaffeensis

<400> 68  
 ggcataaatg ggaatttcta catcagtggg aaatacatgc caagtgcctc gcatttttggg 60  
 gtattctctg ctaaggaaga aagaaataca acagttggag tgtttggact gaagcaaaat 120  
 tgggacggaa gcgcaatatc caactcctcc ccaaacgatg tattcactgt ctcaaattat 180  
 tcatttaaat atgaaaacaa cccgttttta gggttttgcag gagctatttg ttactcaatg 240  
 gatggtccaa gaatagagct tgaagtatct tatgaaacat ttgatgtaaa aaatcaagggt 300  
 aacaattata agaatgaagc acatagatat tgtgctctat ccataaactc agcagcagac 360  
 atgagtagtg caagtaataa ttttgtcttt ctaaaaaatg aaggattact tgacatatca 420  
 tttatgctga acgcatgcta tgacgtagta ggcgaaggca tacctttttc tccttatata 480  
 tgcgcaggta tcggtactga tttagtatcc atgtttgaag ctacaaatcc taaaatttct 540  
 taccaaggaa agttaggttt aagctactct ataagcccag aagcttctgt gtttatttgg 600

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gggcactttc ataaggtaat agggaacgaa tttagagata ttcctactat aatacctact 660
ggatcaacac ttgcaggaaa aggaaactac cctgcaatag taatactgga tgtatgccac 720
tttggaatag aacttggagg aaggtttgct ttctaa 756

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<210> 69  
 <211> 283  
 <212> PRT  
 <213> *Cowdria ruminantium*

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<400> 69
Met Asn Cys Lys Lys Ile Phe Ile Thr Ser Thr Leu Ile Ser Leu Val
  1              5              10              15

Ser Phe Leu Pro Gly Val Ser Phe Ser Asp Val Ile Gln Glu Glu Asn
          20              25              30

Asn Pro Val Gly Ser Val Tyr Ile Ser Ala Lys Tyr Met Pro Thr Ala
          35              40              45

Ser His Phe Gly Lys Met Ser Ile Lys Glu Asp Ser Arg Asp Thr Lys
          50              55              60

Ala Val Phe Gly Leu Lys Lys Asp Trp Asp Gly Val Lys Thr Pro Ser
          65              70              75              80

Gly Asn Thr Asn Ser Ile Phe Thr Glu Lys Asp Tyr Ser Phe Lys Tyr
          85              90              95

Glu Asn Asn Pro Phe Leu Gly Phe Ala Gly Ala Val Gly Tyr Ser Met
          100              105              110

Asn Gly Pro Arg Ile Glu Phe Glu Val Ser Tyr Glu Thr Phe Asp Val
          115              120              125

Arg Asn Pro Gly Gly Asn Tyr Lys Asn Asp Ala His Met Tyr Cys Ala
          130              135              140

Leu Asp Thr Ala Ser Ser Ser Thr Ala Gly Ala Thr Thr Ser Val Met
          145              150              155              160

Val Lys Asn Glu Asn Leu Thr Asp Ile Ser Leu Met Leu Asn Ala Cys
          165              170              175

Tyr Asp Ile Met Leu Asp Gly Met Pro Val Ser Pro Tyr Val Cys Ala
          180              185              190

Gly Ile Gly Thr Asp Leu Val Ser Val Ile Asn Ala Thr Asn Pro Lys
          195              200              205

Leu Ser Tyr Gln Gly Lys Leu Gly Ile Ser Tyr Ser Ile Asn Pro Glu
          210              215              220

```

Ala	Ser	Ile	Phe	Ile	Gly	Gly	His	Phe	His	Arg	Val	Ile	Gly	Asn	Glu
225					230					235				240	

Phe	Lys	Asp	Ile	Ala	Thr	Ser	Lys	Val	Phe	Thr	Ser	Ser	Gly	Asn	Ala
				245					250					255	

Ser	Ser	Ala	Val	Ser	Pro	Gly	Phe	Ala	Ser	Ala	Ile	Leu	Asp	Val	Cys
			260					265					270		

His	Phe	Gly	Ile	Glu	Ile	Gly	Arg	Phe	Val	Phe
	275						280			